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Low-cost fish retailing equipment and facilities in large urban areas of Southeast Asia

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TECHNICAL
PAPER

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by
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Abstract

This paper describes the marketing of fresh and live fish, as well as provides examples of low-cost retailing equipment and facilities used in four large urban centres of Southeast Asia (Manila, Kuala Lumpur, Singapore and Bangkok). It also examines the status, problems and needs of those in the fish retail trade, in particular, the street fish vending sector. The primary data, collected through surveys and interviews, was related to the available equipment/facilities being used; technical characteristics; investment and operational costs; improved technologies; training programmes; national legislation; and investment programmes related to urban street fish vending. Secondary data comprised information complied by national agencies and FAO. Based on the findings of the study, the author puts forward recommendations to promote the street fish vending sector and improve fish retail marketing, while acknowledging the need for more research to be done in the field.

PREPARATION OF THIS DOCUMENT

The growth of the urban areas represents a great challenge to the marketing of fishery products, given the perishable nature and the contribution to food security of these products. The challenge concerns principally the low income consumers and it is with this aim that it was recommended to gather information regarding the experiences in large urban areas in Southeast Asia with relevant details on low-cost fish retailing equipment and facilities. The document reconciles case studies conducted in Manila, Kuala Lumpur, Singapore and Bangkok.

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1. INTRODUCTION

1.1 Scope and Purpose of the Paper

This Technical Paper is addressed primarily to those concerned with the planning, development and administration of urban fish marketing operations and its supporting infrastructure in Southeast Asia. It may be useful to those concerned with fish marketing systems such as itinerant vending and formal and informal street markets; in particular, urban fish distribution and marketing and development of consumer demand for fish and fishery products. It may also be found useful by persons involved in the planning, development and expansion of the retail trade of fresh fish in municipal governments, as well as those engaged with the design of trade policies, legislation and administration.

Urban marketing of live and fresh fish, as well as some examples of low-cost fish retailing equipment and facilities used in four large urban centres of Southeast Asia (Manila, Kuala Lumpur, Singapore and Bangkok) are described as case studies. In addition, some considerations regarding the design and operations of low-cost fish retailing equipment used in fresh and live fish trade are outlined.

1.2 Products Covered

For the purposes of this study, the main products considered were live and fresh fish and shellfish. Fresh fish and shellfish are defined as products that have not been subjected to any process of preservation, except chilling, which reduces temperatures close to the temperature of melting ice (0°C).

Fresh fish was marketed in diverse forms according to consumer preferences, such as:
- Whole
- Headed
- Gutted
- Headed and gutted
- Split
- Fillets (skin on or skinless)
- Double fillets
- Steaks
- Portions
- Minced and minced fish-based products

Shellfish consisted of molluscs and crustaceans as well as cephalopods, which are frequently marketed as:
- Live
- Whole
- Headed
- Shucked (molluscs)

- Headed and gutted
- Peeled and deheaded
- Peeled and deveined
- Cooked (tails, claws/legs)
- Minced seafood (one or more species of fish, squid, shrimp) as well as surimi-based products

In addition, for the benefit of those concerned with planning and investment in retail equipment for perishable fishery products, a brief description of low-cost equipment for street vending of ready-to-eat fish balls, squid balls and fish sausages is included.

1.3 Methodology

The main research objective was to collect information on low-cost retailing equipment and facilities suitable for fish marketing in large urban areas of Southeast Asia, as well as current legislation and improvement programmes for street vending operations. Figure 1 illustrates the steps involved in this marketing research process. In Southeast Asia, the main urban centres have grown at an accelerated rate. The development of informal street food market outlets is due to several factors, such as the lack of an adequate number of other food market outlets, unemployment, and socio-economic conditions of the urban population as well as influx of rural residents into main cities. Street fish vending supplies fish to low-income earners and is a source of income for many others, including women, who otherwise would be unemployed.

Where possible, secondary data compiled by national statistics agencies and FAO sources is used. Primarily, however, this paper relies heavily on information gathered on a firsthand basis through market surveys and interviews with street seafood vendors, public market seafood retailers, super-market staff, officials from national fish marketing agencies and local governments, and visits to wholesale and retail markets in Manila, Singapore, Kuala Lumpur and Bangkok. In addition, INFOFISH, MFRD /SEAFDEC and the FAO Representative office in the Philippines provided data and liaison with local counterpart institutions.

Table 1: Counterpart Institutions, by Country

Country	Counterpart Institutions
Philippines	Bureau of Fisheries and Aquatic Resources (BFAR) Philippines Fisheries Development Authority (PFDA)
Malaysia	Fisheries Development Authority of Malaysia (LKIM) INFOFISH
Singapore	Marine Fisheries Research Department (MFRD), SEAFDEC Primary Production Department, Ministry of National Development
Thailand	Department of Fisheries (DOF), Ministry of Agriculture and Cooperatives

It is important to note that fish prices, like those of other commodities, are subject to fluctuation. The prices found in this study were current at the time of the market surveys.

1.3.1 Primary and Secondary Data Collection

Table 2 shows the schedule of field work; the surveys were conducted from 13th February to 7th March 2000. Of the 165 respondents interviewed during the surveys, about 68 percent were either street vendors, retailers or wholesalers/traders and 32 percent were national government officials, local government officials and consumers at street fish markets.

Table 2: Schedule of Field Work

City	Starting Date	Completion Date
Manila	13/2/00	20/2/00
Kuala Lumpur	20/2/00	24/2/00
Singapore	24/2/00	29/2/00
Bangkok	29/2/00	7/3/00

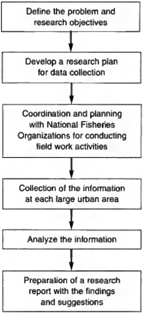
On the field and before the start of the surveys and interviews, a certain amount of preparatory work was required to co-ordinate with national counterparts including the preparation of a detailed schedule of visits and interviews planned. Questionnaires were e-mailed to counterpart agencies in advance, to be distributed particularly to personnel with access to data, regarding training programmes, national legislation and improvement programmes related to urban street fish vending and infrastructure. In most instances, background data on fish marketing, street vending operations and street ready-to-eat food vending was collected from various sources. Compilation, assembly and analysis of these background data in most cases was of particular importance to reveal the most conspicuous gaps in information and to identify areas which needed particular attention.

Among the essential requisites in the preparation of the field surveys were the collection of detailed and reliable city maps. In addition, all survey questionnaires (4) were prepared in advance, tested and modified accordingly. Weights, currencies and measures actually used in each city were employed and care was taken that the unit used was clearly indicated on the questionnaires. Most questionnaires were, as a rule, completed by the person conducting the interview in the local language or in English, and at the end of the day, were translated when required. Questionnaires used in connection with background data were filled out by responsible officials from local governments or concerned agencies during the survey work and later checked by the interviewer. In some cases, the interviewer collected the questionnaires at a later date and checked the information with the responsible officer to clear up doubtful points. Fundamentally, purposive/judgement sampling (based on the researcher's judgement, to select population members who are good prospects for accurate information) was used in the selection of fish vendors for interviews, in accordance with the enumerator's experience and knowledge of the local behaviour as well as the availability of time. The survey teams aimed at obtaining specific information on improved fish retailing equipment and facilities, *modus operandi* of street fish vendors, operational costs and fish prices; therefore, in most cases, street fish markets were chosen intentionally according to the needs of the study. The number of fish vendors interviewed varied from location to location, but represented about 10-20 percent of the total street fish vendors in each site and provided a representative sample of the various types of stalls/equipment available and fish and fishery products offered. The time schedule for collection of primary data was set up so as to coincide with the street fish vendors' working hours at the marketplace.

It was important for interviewers to make a good presentation to avoid creating a doubt in the respondent's mind as to the confidential nature of the survey. In order to avoid answers that came about as a result of the respondent wishing to mislead the interviewer, several fish vendors operating in the same marketplace and offering the same type of products were interviewed. Where the interviewer suspected that he/she was given misleading answers, he noted this under "remarks" and sought to verify the suspected information with other fish vendors in the same marketplace. In some cases, follow-up interviews were required to clear up some points or in cases where incomplete answers have been given.

Additional statistical information on retail prices of some fishery products, red meats/ poultry and wholesale prices of live fish, were also collected by national counterparts through follow-up surveys, and are included accordingly.

Figure 1: The Marketing Research Process for Low-cost Fish Retailing Equipment and Facilities in Large Urban Areas of Southeast Asia


Define the problem and research objectives
Develop a research plan for data collection
Coordination and planning with National Fisheries Organizations for conducting field work activities
Collection of the information at each large urban area
Analyze the information
Preparation of a research report with the findings and suggestions

2. CASE STUDY: METRO MANILA

2.1 Introduction

Manila supports a substantial market for live, fresh, frozen, cured fish and canned fishery products. The Metropolitan Manila Area (MMA) was established in 1975 through Presidential Decree 824 and amended by Presidential Decree 1396, which established this geographical area as the National Capital Region (NCR). Under the administration of the Metropolitan Manila Development Authority, the NCR comprises the following cities: Manila, Quezon City, Caloocan, Pasay, Mandaluyong, Pasig, Makati, Muntinlupa, Marikina, and Las Piñas. Currently the NCR is administratively divided into seven municipalities, namely: Malabon, Navotas, Parañaque, Pateros, San Juan, Taguig and Valenzuela, with an estimated population of 10.4 million in 2000, which represents about 12.8 percent[1] of the country's total population. According to latest estimates, the total projected population of the Philippines[2] for 2000 is about 81 million. Under the 1991 Local Government Code, the City Council of Metro Manila was granted local autonomy and regulatory powers concerning basic city services, and enforcement of inspection of food products and urban sanitation. It is also in charge of policy formulation and supervision of retail food markets and street food vending.

In 1997, FAO fisheries statistics reported an apparent annual per capita fish supply of 31.7 kg in the Philippines. Currently the Philippines, Malaysia and Singapore have the highest per capita supply of fish in the ASEAN[3] region. A breakdown of the annual per capita supply of fish for the Philippines in 1997 is shown in Table 3.

ASEAN countries, particularly the Philippines, Singapore and Malaysia, offer a strong regional fish and fishery products market with significant fish imports. The Philippines is by far the major importer of small pelagics, either frozen (sardine, sardinella, mackerel and round scad), fish meal (mainly sardine, anchovy and mackerels) or canned (mainly sardines in tomato sauce). Japan and Russia are the main suppliers of frozen small pelagics and over 80 percent of the fishmeal comes from Chile and Peru. In 1997, the total imports of fishery products were 295,015 metric tonnes with a FOB value of US$ 138.1 million. The total exports of fishery products for the same period were 173,887 metric tonnes with a FOB value of US$ 549.8 million. In 1999, official statistics [4] showed that the country's total fish catches were 2.86 million metric tonnes, with 34.2 percent coming from aquaculture production, 33.3 percent from commercial fishing and 32.5 percent from small-scale fishing.

---

[1] Based on population projections for the Philippines, by the National Statistics Office, 1995.

[2] Based on the total midyear population data for the year 2000 (81,159,644 inhabitants); international database of the US Bureau of the Census, International Programs Center. (http://www.census.gov).

[3] Association of Southeast Asian Nations (ASEAN), with the following member countries: Brunei Darussalam, Cambodia, Indonesia, Laos, Malaysia, Myanmar, the Philippines, Singapore, Vietnam and Thailand.

[4] Press release, January, 2000, Bureau of Agriculture Statistics, Philippines.

Table 3: The Philippines: Fish per Capita Supply (1997)

Food Item	Annual per Capita Supply (kg/year)
Freshwater fish	4.2
Demersal fish	4.4
Pelagic fish	17.9
Marine fish, other	0.2
Crustaceans	2.0
Cephalopods	0.9
Molluscs, other	2.0
Total Fish	**31.7**

Source: FAO Food balance sheets, 1994-97

2.2 Fish Distribution Channels

The domestic market for fish and fishery products is distinguished principally by the dependence on supplies from aquaculture, small-scale fisheries and commercial fisheries. It should be noted that a significant proportion of aquaculture produce, particularly shrimp, is exported. Both freshwater and marine fish and fishery products are regularly being traded in Metro Manila's domestic seafood market. Fish and fishery products are staple foods in the Filipino diet, and constitute the main source of animal protein. Chilled and live seafood is landed at the main Metro Manila fishing port, namely Navotas Fishing Port Complex (NFPC), which handles about 260,000 to 280,000 metric tonnes of fish annually. The Philippines Fisheries Development Authority (PFDA) is in charge of the management and operation of NFPC and of monitoring and compilation of fishery statistics and related fish marketing information. Average daily volumes of seafood landed in Navotas FPC vary according to the fishing season from about 430 to 980 metric tonnes. Navotas FPC is equipped with two main trading halls with a market floor area of 8,320 m^2, on which the brokers or commission agents display and trade fish. Fish at the wholesale marketing halls is sold mainly by secret bidding (whispering) in a public auction conducted by brokers, who sell to retailers, institutional buyers, processors and seafood traders. The wholesale market halls operate regularly at night from about 20:00 hours to 03:00 hours. During 10:00 hours to 13:00 hours, wholesale/retail marketing operations are also conducted at Navotas auction halls for fish coming from small-scale fisheries and aquaculture farms. However, some of the fish and shellfish coming from other landing places or fish farms, do not go through the Navotas auction halls, but are sold through wholesale trade at the Divisoria Central Market, Metro Manila's major food wholesale market, and Pasig wholesale market (mainly dealing with cultured brackishwater fish coming from the Laguna de Bay area).

Live fish

There is a significant domestic live fish trade, a portion of which does not go through the auction, but are handled by private wholesalers. These wholesalers usually operate small live fish carrier trucks (with tanks and aeration systems), collecting live milkfish (*Chanos chanos*), groupers and freshwater fish (tilapia, catfish, snakehead) produced by aquaculture farms. Domestic live shellfish trade comprises molluscs such as cultivated green mussel (*Perna viridis*) and oyster (*Crassostrea* spp.); crustaceans include mangrove crabs (*Scylla* spp.). These live shellfish are regularly distributed in the Philippines using air, -sea and road transport; supplies come from brackishwater ponds and small-scale fisheries. Most of the production of oysters and green mussels are sold alive and a relatively limited proportion is sold as shucked flesh, either fresh or salted. There is a very limited export trade of frozen, chilled and dried oysters to Hong Kong and Singapore. Oysters and green mussel farm operators usually sell their production either through middlemen wholesalers or to a lesser extent, by direct retailing. Mussels and oysters are generally packed and distributed in woven plastic bags (usually holding about 30 kg) and traditional vegetable fibre baskets (locally known as *kaing*), holding about 20 – 25 kg.

There is also a significant export trade of live reef fish, particularly groupers, with supplies coming from capture fisheries. Export markets for live groupers include Hong Kong and Singapore. The domestic market is growing, but is limited mainly to Chinese restaurants. Current ex-farm prices for marine cage and brackishwater pond-cultivated live groupers are about US$ 7.5 – 9/kg.

Crabs

Four species of crabs are of commercial importance in Metro Manila; these are pelagic swimming crab (*Portunus pelagicus*), mangrove crab (*Scylla serrata*), peregrine crab (*Varuna litterata*) and horned ghost crab (*Ocypode spp*). Mangrove crabs are considered a delicacy and are always marketed alive. The Metro Manila market is characterised by consumer preference for live mangrove crabs which command high prices; in particular, ripe females fetch premium prices. The domestic market is supplied with mangrove crab the year-round, with a peak season from May to September. During the Christmas period, there is an increased demand and prices of live mangrove crab are relatively higher.

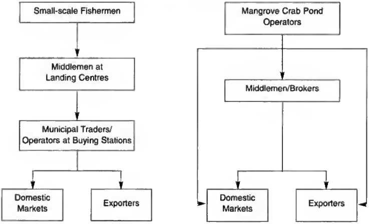
Table 4 : Commercial Grading of Live Mangrove Crab

Grading	Size (g/piece)
Small	250 – 300
Medium	300 – 500
Large	500 – 850
Extra large	850 – 1,000

Source: Crab traders at Seaside Fish Market, Metro Manila.

There is a significant export trade of live mangrove crab to Taiwan and Singapore; Table 4 shows the size grading of live mangrove crabs for export markets. With the increasing demand both from export and domestic markets, the current production has increased significantly to about 4,000 metric tonnes annually. Size requirements of live mangrove crab in the domestic market vary from market to market. The catering sector, particularly restaurant chains and specialised seafood restaurants, prefer small, medium and large sizes; in the retail markets the most common sizes available are small and medium. The minimum commercial size for export purposes is more than 200 g/piece; however, market requirements are oriented toward medium to large sizes, with strong preference for ripe females which fetch premium prices. The relatively high survival rates (5 – 7 days) of mangrove crabs out of the water may be explained based on the fact that they have gill structures that allow adequate levels of oxygen uptake in air. Therefore, local handling methods based on a practical understanding of the crab's physiology are used to minimise capture and transport stress and to cover the overall logistics of export marketing as well as for the domestic trade. Main preventive handling practices for live mangrove crabs include the control of temperature, humidity and careful handling to avoid injuries.

Figure 2: Simplified Marketing Channels for Live Mangrove Crab


Small-scale Fishermen
Middlemen at Landing Centres
Municipal Traders/ Operators at Buying Stations
Domestic Markets
Exporters
Mangrove Crab Pond Operators
Middlemen/Brokers
Domestic Markets
Exporters

Dried fish

There is an important dried fish market in Metro Manila for products such as dried anchovies, dried-salted and salted mackerel, shrimp, squid, cuttlefish and oyster. Small sardines and anchovies are usually brine-salted and dried whole; larger fish are split open, cleaned, salted and sun-dried. Traditional smoked fish products, in particular sardines, mackerel and milkfish are also sold at retail markets in Metro Manila. Speciality cured fishery products such as boneless smoked milkfish are usually sold under several commercial brands well packed in plastic bags; marinated split open and dried milkfish (with garlic, ginger, black pepper, vinegar and salt) is also sold at retail level, especially in the public markets. The domestic dried fish production is significant and the country's per capita apparent consumption of cured fish (including dried-salted fish) is one of the highest in the region. In addition, locally produced fresh as well as dried seaweed products are also offered in the market. Fresh *Caulerpa* and *Gracilaria* seaweeds are usually consumed raw or blanched as the main ingredient in traditional salad dishes or as garnishes for other seafood dishes.

Table 5 shows the average retail prices of dried fish in Metro Manila during 1999. The most expensive products were dried squid at US$ 9.4/kg, followed by dried anchovies and dried-salted groupers at US$ 3.2/kg and US$ 2.96 respectively. The cheapest products were dried whole sardines, split dried-salted bigeye scads and Indian mackerel at US$ 2.1/kg, US$ 2.2/kg and US$ 2.3/kg respectively.

Table 5: Average Retail Prices of Dried Fish in Metro Manila
Period: January – December 1999

Dried- salted Fishery Products	Retail Price (P. Peso/kg)
Split Indian Mackerel (*Rastrelliger kanagurta*)	95
Whole Dried Sergestidae Shrimp (*Acetes indicus*)	114
Split Fusilier (*Caesio spp.*)	97
Split Rabbit Fish (*Siganus spp.*)	108
Split Bigeye Scad (*Selar crumenopthalmus*)	91
Split Trevally (*Caranx spp.*)	115
Split Groupers (*Epinephelus spp.*)	120
Split Squid (*Loligo spp.*)	384
Whole Fringescale Sardinella (*Sardinella fimbriata*)	106
Whole Indian oil Sardine (*Sardinella longiceps*)	86
Whole Commerson's Anchovy (*Stolephorus commersonii*)	131

Source: Philippines Fisheries Development Authority (PFDA)

Canned products

With population rising and coastal fishery stocks declining, the Philippines is becoming increasingly reliant on imports of frozen fish to satisfy local fish canning industry demand. Canned fish, in particular canned tuna and sardine products, are locally manufactured, while imported canned sardines in tomato sauce are very popular in supermarket chains, public markets and small grocery retail outlets.

Metro Manila still boasts a large number of small-scale independent grocery/food retail shops locally known as *sari sari* stores, that serve mostly neighbourhood clientele and which proliferate in every urban area. Many of these retail outlets sell a wide variety of canned seafood and some cured and fermented fishery products. *Sari sari* stores and supermarket chains have the largest share of the canned seafood retail market.

Popular canned seafood packs include the following:

- Sardines in tomato sauce, in cylindrical cans with net contents of 155 g
- Mackerel in tomato sauce or in vegetable oil, in round cans with net contents of 180 g to 250 g
- Tuna in oil, solid, chunk and grated packs, in round cans with net contents of 180 g
- Squid in natural ink, in round cans with net contents of 400 g
- Tuna with vegetables & seasonings, mechado, afritada, caldereta and hot & spicy packs, in cylindrical cans with net contents of 155g
- Milkfish in oil, tomato sauce and in brine (salmon style)

The consumption habits in Metro Manila vary according to the consumer's socio-economic level, with upper and middle income homes buying more high value tuna packs and lower income homes buying low-priced sardine products. The most frequent practice of consuming canned tuna products is either as a salad or with bread (sandwiches); canned sardines and milkfish are usually served with cooked rice or bread as a snack, as well as sautéed with garlic, onions and vegetables.

Table 6 shows the average retail prices of canned seafood products in Metro Manila during 1999. In general, canned squid and tuna in oil packs were the most expensive products; the cheapest canned products were sardine in tomato sauce and mackerel in tomato sauce or in oil.

Table 6: Average Retail Prices of Canned Seafood Products in Metro Manila
Period: January – December 1999

Product Form	Retail Price (P. Peso /can) (155 g.) Net Contents	Retail Price (P. Peso /can) (180 – 250 g.) Net Contents	Retail Price (P. Peso /can) (400 g.) Net Contents
Sardine in tomato sauce	6.35 – 9.50	10.05 – 11.45	15.50 – 20.30
Mackerel in tomato sauce/oil	6.35 – 9.05	9.50 – 12.50	14.25 – 25.30
Squid in natural ink	8.25 – 15.65	14.25 – 25.50	22.55 – 39.50
Tuna in oil, chunks	10.75 – 14.75	17.65 – 22.00	n/a

Source: Philippines Fisheries Development Authority (PFDA)

Seafood reaches Metro Manila consumers through a multi-level system, which may involve at least three to four transactions before a fish or fishery product is purchased by a consumer in a public fish market, or supermarket, or eaten in a restaurant/food stall. The channels of distribution incorporate locally caught and processed seafood, live and chilled cultured species and frozen imported items from the region and around the world, which can be processed locally. A long chain of traders/middlemen usually distinguishes the seafood distribution chain in Metro Manila, starting from Navotas FPC to the final consumer. Supermarket chains often obtain supplies from direct importers or distributors of frozen and canned seafood products, which makes possible a shorter distribution chain.

2.3 Metro Manila's Retail Fish Market

Metro Manila's urban area is home to a variety of retail establishments offering live, fresh, frozen, cured and canned seafood to consumers. The range of shopping options include public retail markets, supermarkets and street hawkers which offer a wide selection of live fish, fresh fish, frozen and canned fishery products as well as cured and fermented fish. Public markets currently hold a significant share of the retail trade of chilled, live fish, fermented and cured fishery products. Large supermarket chains and medium-sized independent supermarkets offer mainly chilled, frozen, cured and canned seafood. Supermarkets are currently handling a less significant portion of the retail market share for chilled fish and fishery products. The sales of chilled fish in supermarkets are still not significant, because housewives associate fresh/chilled fish with public markets and only grocery goods/canned fish with supermarkets. Despite the fact that most supermarkets are low-cost, low-margin, high volume, self-service operations designed to provide the consumer's total needs for food and household-maintenance products, there is still a strong preference to shop for chilled/fresh seafood in the public retail markets, and to a lesser extent at street hawker stalls. Most supermarkets have well-defined seafood product sales strategies, including adequate product mix and a variety of frozen, fermented fish products, fish sauce, and canned seafood products.

The most popular product form is whole fresh fish and preferred species of seafood are: milkfish, Spanish mackerel, Indian mackerel, all tunas, *Loligo* squid, round scad, slipmouth, red snapper, groupers, anchovies, sardines, golden *Caesio*, lizardfish, tilapia, shrimps and mangrove crabs. Recent trends indicate that tilapia (hybrid strains) is increasingly becoming popular in the domestic market, and is now considered as a substitute for milkfish, which is regarded as first-class fish. When comparing retail prices of fresh tilapia with milkfish, currently tilapia is sold at lower price levels, with average retail prices of about US$ 1.7 – 1.9 per kg and US$ 2.57 – 2.69 per kg respectively. Some fish retailers indicated that sometimes both species are sold at the same price level.

Table 7 shows the comparative retail prices for fresh fish at selected street seafood markets and public markets in Metro Manila. In general, retail prices at street seafood markets were slightly lower than public markets with a price difference of 4.3 to 12%, however some products like Indian mackerel and hairy shrimp were at the same price level. Taking into consideration that most supermarkets have similar or slightly higher prices than public markets, we can conclude from this relatively limited data that street seafood markets are currently offering slightly lower retail prices for fresh seafood in Metro Manila.

Table 7: Comparative Retail Prices of Fresh Fish at Selected Street Seafood Markets and Public Markets in Metro Manila

Species	Street Seafood Market Price (P. Peso/kg)	Public Market Price (P. Peso/kg)
Milkfish	90 – 120	100 – 120
Tilapia	65 – 75	70 – 85
Squid	100 – 130	110 – 130
Bullet & frigate tuna	60 – 70	65 – 74
Yellowfin tuna	110 – 130	120 – 130
Catfish	60 – 70	65 – 75
Snakehead	110 – 120	100 – 125
Anchovy	60 – 65	60 – 65
Indian mackerel	65 – 90	80 – 90
Mackerel (imported)	50 – 55	n/a
Round scad	60 – 70	65 – 75
Trevallys (*Carangoides* spp.)	120 – 150	125 – 155
Hairy shrimp (small size) (*Metapenaeus* spp.)	140	135 – 145

Source: Data from field market surveys carried out by the author and counterparts in February 2000.

Table 8 shows a comparison of average wholesale and retail prices for selected fish species in Metro Manila for 1999. The estimated market margins for chilled fish ranged from 11.8 to 136 percent, with an average marketing margin of 57.6 percent. Based on the relatively limited data obtained from the field surveys in general, the results obtained were in line with the above marketing margins.

At most public markets, there are full-service seafood stalls in charge of taking and preparing orders from consumers. Preparation may include weighing a specific quantity of fish or shellfish, gutting, cleaning or cutting a whole fish to the desired size or product form. Orders are then wrapped for the consumer in plastic bags. This service is considered as a marketing tool used to maintain the loyalty of regular clientele and attract new customers.

Live fish and shellfish, including mangrove crab, oysters, mussels, catfish, snakehead and tilapia, are well-established products in the domestic market. They are sold in simple water tubs, bamboo baskets or cages. Live crab retailers interviewed at the Seaside private fish market indicated that their daily sales range from P. Peso 6,000 to 12,000 and during Christmas, sales could reach up to P. Peso 36,000/day. These specialised shellfish retailers usually operate from 4:00 hours to 23:00 hours, seven days per week. They indicated that their average daily sales comprised 40 to 50 kg of live crab, with an estimated 3 – 5 kg sold in chilled form at reduced prices. The catering sector is also an important outlet for mangrove crab, oyster, mussels, catfish, and tilapia, and recently for giant freshwater prawn. Some restaurateurs indicated strong consumer preference for mangrove crabs, oysters and mussels, traditionally cooked grilled, steamed or fried with vegetables (with coconut milk). Giant freshwater prawn are sold through the catering sector in specialised restaurants including some Thai restaurants operating in Metro Manila. The species is well accepted by local consumers, but there is a need to develop the market and create regular demand. However, supplies of giant freshwater prawn are limited, coming mainly from a few freshwater ponds within Central Luzon.

Seasonal variations in supplies and prices of fresh fish are currently affecting demand for fresh/chilled fish and its substitute products. At the retail level, the main substitute product to fresh fish is dressed chicken, followed by pork. When prices of preferred species such as fresh milkfish increase, consumers may shift to dressed chicken or to low-cost species such as fresh sardines, Indian mackerel or round scad, if available. Retail prices of fresh cultivated milkfish and dressed chicken have not increased significantly since 1998 and this trend is basically market-determined. In 1999, a PFDA study of the milkfish industry[5] indicated that relatively lower domestic wholesale and retail prices for milkfish had aggravated the already delicate situation of milkfish producers, who were facing significant increases in the costs of inputs (mainly imported feeds and feed components) and declining demand caused by a drop in consumer buying power. Local production of cultivated milkfish is highly dependent on imported fish meal and other feed ingredients; therefore any significant currency fluctuation or price rise could result in a cost-revenue squeeze with declining profits.

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[5] "A Situationer of the Bangus Industry in the Philippines" by Ramon Caindec, 1999

Table 8: Average Wholesale & Retail Prices of Selected Fresh Fish in Metro Manila
Period: January – December 1999

Species	Wholesale Price (P. Peso[6]/kg)	Retail Prices (P. Peso/kg)	Marketing Margin (%)
Indian Mackerel (*Rastrelliger kanagurta*)	81.86	78.32	26.61
Milkfish (*Chanos chanos*)	62.54	81.32	30.03
Threadfin (*Nemipterus spp.*)	53.24	86.96	83.34
Fusilier (*Caesio spp.*)	70.83	86.64	22.32
Round Scad (*Decapterus spp.*)	48.82	65.22	34.14
Bigeye Scad (*Selar Crumenopthalmus*)	60.85	76.60	25.88
Squid (*Loligo spp.*)	70.99	103.61	45.95
Trevally (*Caranx spp.*)	55.97	77.40	38.29
Ponyfish (*Leiognathus spp.*)	29.83	70.39	135.97
Goatfish (*Upeneus spp.*)	29.88	87.91	127.28
Trevally (*Caranx spp.*)	67.63	117.84	74.24
Indian Oil Sardine (*Sardinella longiceps*)	20.27	43.23	113.27
Bullet & Frigate Tuna (*Auxis spp.*)	59.29	66.33	11.87
			Average margin: 57.60 %

Source: Philippines Fisheries Development Authority (PFDA)

Table 9 shows a comparison between available fresh meat, poultry and small pelagics offered in the Metro Manila retail food market in February 2000. Beef was the most expensive animal protein source, with an average retail price of US$ 3.5/kg, followed by pork with an average retail price of US$ 1.75/kg, and chicken with an average retail price of US$ 2.1/kg. Small pelagics such as sardines and anchovy, with an average retail price of US$ 1.2/kg and US$ 1.5/kg respectively, were the cheapest protein source.

Table 9: Comparative Average Retail Prices of Meat, Poultry and Fish in Metro Manila
Period: February 2000

Product	Average Retail Price (P. Peso/kg)
Red Meats:	
Lean pork	110
Pork loin	112
Beef loin	140
Beef tender chuck	141
Poultry:	
Dressed chicken (chilled)	80
Chicken breast /chilled)	88
Chicken drumstick (chilled)	95
Eggs	62

Product	Average Retail Price (P. Peso/kg)
Small Pelagics (whole):	
Anchovy	63
Sardines	50
Round scad	70
Indian mackerel	85
Other fish species (whole)	
Bullet & frigate tuna	67
Catfish	68
Tilapia	74
Milkfish	108

Source: Data from field market surveys carried out by the author and counterparts in February 2000.

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[6] In February 2000, the rate of exchange was US$ 1.00 equal to 40.87 Philippine Peso (P. Peso).

Public retail markets and supermarkets currently offer a variety of traditional minced fish products and surimi-based products. These products include fish balls, squid/cuttlefish balls, native fish sausages, fish burgers, and surimi analogues. In addition, minced fish-based dried fish/shrimp crackers (locally processed and imported) are also offered. Traditional fish & squid balls and native fish sausages (fish *quekiam*), and snack type foods, which are consumed mainly deep fried and dipped in sweet and sour sauce, are very popular among consumers. The average wholesale prices of squid balls and native fish sausages varied from P. Peso 78 to 80 per kg (US$1.71 – 1.96 per kg) and P. Peso 60 to 64 per kg (US$1.46 – 1.56 per kg) respectively. The main sources of raw material are from by-catch, market surpluses and some low-cost freshwater species.

Besides the above-mentioned minced fish products, value-added products such as cuttlefish/squid/fish/shrimp nuggets and patties and shrimp tempura are locally processed and marketed. Some supermarket chains are also offering pre-packed chilled and frozen imported seafood, including Japanese-style sushi products (e.g. shrimp roe, tuna *tekka maki*, minced tuna & chilli, crab stick roll).

Imported frozen fish (mainly low-cost small pelagics and cuttlefish) are increasingly being distributed in Manila's retail markets at relatively lower prices than locally caught species. During field surveys, it was noticed that imported frozen fish blocks were regularly traded in both the Navotas FPC and Divisoria wholesale markets. This market trend apparently is in response to the increased domestic demand for fish, particularly during the lean fishing season. Therefore, consumers' attitudes toward frozen fish are gradually changing; it now appears that frozen fish is considered more desirable, but still not superior to its fresh/chilled counterpart, particularly in terms of its texture. This is a significant change from previous years, when most consumers strongly preferred fresh/chilled fish; frozen fish was not well accepted even if they were the same, or fresh fish prices are relatively too high. In general, these imported frozen fish are currently retailed at prices 15 to 35 percent lower than similar fresh/chilled species.

2.4 Street Food Hawkers in Metro Manila

Street food hawkers in Metro Manila, in particular those selling fresh seafood and ready-to-eat seafood, are considered to be catering to middle and low-income consumers. Current data on the total number of street food hawkers indicates an estimate of some 15,000 (about 5,000 are licensed), according to the Manila Hawkers Permit Services, Bureau of Permits, Office of the Mayor. This number includes those vending ready-to-eat foods and beverages, raw food (fruits, vegetables, seafood, poultry) and native sweets and delicacies. Street seafood hawkers currently play a significant role as fresh/chilled seafood suppliers in Metro Manila; however, there is no detailed data on the number of hawkers operating in the city. The main characteristics of fresh/chilled fish street hawkers include the following:

- Setting up temporary stalls on busy streets during certain times of the day. This is the simplest market system, making use of existing road infrastructure and with a low level of investment. In general, it is easy to relocate facilities/equipment to another site, which often causes street congestion and traffic management problems. They are usually not allowed to operate in areas surrounding public markets as they compete with the permanent fish retailers;

- Carrying fresh seafood in baskets, metal/plastic tubs or insulated boxes from the wholesale markets to the street marketing areas using either motorcycles, taxis, public transportation and private cars and vans (jeepneys);
- Limited provision of adequate potable water supplies and waste disposal systems to ensure appropriate sanitary conditions;
- In general, street food markets, when compared with public markets or supermarket chains, offer significantly less variety of fishery products, but with the advantage of being less expensive. In most street food markets visited, besides fish and fishery products, vegetables, fruits and other items such as charcoal, noodles, pork meat and fresh dressed chicken, were also offered;
- In addition to the regular practice of selling by weight, a kind of "pantry" service was also available, where fish and fishery products are sold in extremely small quantities and in fractions of the most common units of sale, e.g. sales by small dishes or small heaps.

Retail sales of raw food, in particular fresh fruits and vegetables, and fresh cured seafood at busy streets or around public markets by informal vendors in Metro Manila, are an integral part of the Filipino marketplace. These market outlets are locally known as *talipapas* and according to municipal legislations, are not permitted to operate within a radius of 200 meters from the public markets. However, itinerant street fish vendors peddling from place to place and carrying two baskets for fish display/transport on shoulder poles were not common in urban areas.

In the past, Metro Manila was besieged by the problem of street hawkers, sidewalk vendors and ambulant peddlers. Municipal authorities were then authorised to establish flea markets (*tiangge*) or vending areas in selected streets, roads and open spaces. The municipal ordinance No. 79 – 2 of 1/5/79, issued by the Metropolitan Manila Commission, indicated that the Mayors of the cities and municipalities in Metro Manila were in charge of the design, measurements and specifications of the structures and equipment to be used in these flea markets or vending areas; the allowable distances; the days and times allowed for conduct of the business authorised; the rates of fees or charges to be imposed, levied or collected; the kinds of merchandise, goods and commodities sold and service rendered; and other matters and activities related to the establishment, maintenance, management and operation of the flea markets and vending areas. However, the establishment of such flea markets and vending areas under such terms and conditions was subject to the final approval of the Metropolitan Manila Commission.

With the implementation of the Presidential Decree 856, Code of Sanitation of the Philippines, hawkers are no longer allowed to sell food on the streets. The City Council of Metro Manila formulates and implements policies on the operation, licensing and control of hawkers. The

Bureau of Permits under the City Council of Metro Manila, Office of the Mayor, is directly in charge of licensing street hawkers and enforcing local regulations. Street food vending is considered illegal under the following local legislation:

Offence/Violation	Legislation
i) Traffic obstruction	Police Manual Provisions
ii) Prohibition in the use of utensils for ambulant vendors	Code of Sanitation

Nevertheless, street food hawkers are still operating in Metro Manila and current trends indicate that their number is increasing in the more commercial areas. Currently, a municipal fine (P.Peso 5) is levied on all street vendors found plying their trade within a 200-metre distance from public markets for the use and occupancy of city property, in accordance with Executive Order No. 41. The main factors for this growth in street food vending can be explained as follows:

i) Local eating habits, the cultural significance of street food hawkers, socio-economic environment, high unemployment rates, rapid urbanisation and urban population growth;

ii) Loyal patronage by a growing clientele; street food vending has emerged in response to a socio-cultural need for inexpensive nutritious foods. In the particular case of fresh seafood, informal street markets operating at strategic locations during the busy hours of the day save customers time and/or money;

iii) The effects of the Asian financial crisis, which dragged the country's economic growth down, had severely hit the urban poor population. Therefore, street food vending activities flourished;

iv) The change in the role of the Metro Manila municipal authorities, which is operating under difficult conditions, including the negative effects of the economic crisis on the urban poor population. The implementation of a participatory approach and education programmes in street food business, public information campaigns and the recognition of street food marketing as an important informal activity were necessary changes in policy, which helped to clarify the benefits and disadvantages of unregulated street food vending. However, specific interventions (such as adequate training, credit, improved food safety, hygiene and inspection, equipment/infra-structure development programmes and policy formulation to support regulated street food vending) are still confronted by financial problems and lack of adequate manpower for law enforcement. In most cases, it will require some time to gradually implement the necessary changes.

Currently the City Council of Metropolitan Manila is planning to regulate street food vending to include the designation of specific areas in the city for vending as well as provision of support to vendors through the construction of inexpensive food stalls (with sanitary facilities).

It was observed during field surveys that the fish offered by street hawkers was of acceptable to good quality. Most consumers interviewed at informal street fish markets mentioned that they had a good to acceptable experience with fish purchased there. In addition, it appeared that consumers appreciated the convenience of obtaining readily available seafood at street fish markets. Based on observations, most street fish markets visited were well accepted by consumers and provided personalised services. It was evident that consumers appreciate seafood hawkers, who were in general, knowledgeable about seafood and who cared about the needs of the consumers. Most street fish market outlets surveyed catered to middle and low-income consumers on busy corners of Metro Manila. Low-income families may purchase fish in small lots (heaps/dishes). Based on direct observation and limited survey data, we recognise that convenience, strategic location and affordable prices directly influence repeat purchase of street vended fish, rather than solely customer satisfaction and loyalty.

At most street food markets outlets visited, acceptable to fair conditions were observed regarding fish handling practices. Usually, seafood was displayed without ice; however some small pelagics, shrimp and squid were kept in plastic tubs or trays in a slush of ice and water. Most street fish vendors had at least one insulated box to keep chilled fish with crushed ice and one (1) 10 – 15 litres capacity plastic bucket or container with a cover for storage of potable water for fish cleaning. Regarding the variety of fish and fishery products at street markets, most stalls had between four to eight fresh/chilled fish species or 2 – 4 fishery products (mainly cured fish and fermented) on display. Fresh/chilled fish stalls offered only fresh fish, while specialised stalls displayed only cured fish (smoked and dried-salted fish). Most fish hawkers indicated that they handled inventories of fresh fish for one working day, while a few indicated that they kept fresh fish on ice for two days. On average, street seafood vendors operated about 6 to 8 hours daily; most indicated that the average number of working days is about 7 days per week. The average daily sales per stall are about 50 kg of fresh fish and shellfish, 5 – 7 kg of dried fish and 4 – 5 kg of smoked fish.

Provision for solid waste to be deposited in bins was inadequate to fair in most street fish market outlets. However in most of the street markets visited, there was not much solid wastes in evidence. Most vendors indicated that they manage solid waste collection and disposal by themselves. The most common procedure was to store wastes in a woven fibre basket or plastic bag which stood without a lid until full. Hygienic conditions could be greatly improved, if adequate potable water supplies (tap water) and solid waste bins with lids could be made available to street fish markets.

The use of simple dial metallic thermometers is suggested to regularly measure the temperature of fish on display at street fish markets. Dial thermometers can easily be calibrated to a known temperature by adjusting a hex nut located under the dial. These thermometers were available at some supermarkets and specialised shops. This basic tool could be included as part of the training kit for street fish vendors. In addition, the provision of an adequate wastewater drainage system to street fish market outlets is greatly needed. Water is used extensively in fish markets not only for fish cleaning, but also to flush offal and blood from equipment and floors, and to flume wastewater to floor drains and collection sumps. The first step for the implementation of potable water supplies (tap water) to individual stalls at street fish markets should be to analyse water use patterns, install water meters and regularly record water consumption. The next step should be to undertake a survey of all market area and ancillary operations to identify wasteful practices and undertake corrective actions. Each street fish vendor should pay according to their water consumption and proportionally for the provision of wastewater drainage systems.

Although street vending may be a family business, the survey indicated that women were the main operators. This reflects the need of most poor women to balance income generation with household responsibilities. A limited gender analysis showed that most women and men run street vending as a family business. Other observations with regard to women engaged in street seafood vending were:

- Women were more personal when it comes to dealing with consumers. In general, they were careful with words and more patient in handling business problems;
- Consumers, fish wholesalers/middlemen, local government inspectors and police officers tended to be more patient and friendly when dealing with women;
- Some women indicated the difficulty in balancing the demands of business and family. However, most women interviewed indicated that street fish vending gave them greater time flexibility than other types of jobs/businesses, with the advantage that it does not need as much capital or skills;
- Taking into consideration women's predominant role in street fish marketing, greater female participation in training activities in the fields of small business management, fish handling and marketing should be encouraged.

The principal challenges with regard to informal street fish vending in Metro Manila are therefore the need for effective and sustainable interventions and the formulation of a comprehensive policy. To be effective, statutory requirements (including licensing), should be properly linked to training, monitoring, supervision and equipment/infrastructure development programmes. In particular, seafood street vending should have adequate provision of basic facilities for handling, chilled storage, preparation and waste disposal which can be provided in the street areas where seafood vendors regularly operate. In addition, depending on the type of seafood prepared and sold (e.g. chilled raw fish and cooked fish/squid balls), working hours, working places, and *modus operandi* (with fixed stalls or itinerant vendors with push carts), vendors may require other equipment and facilities. They may also have different views regarding proposed improvements of their services and facilities. The views of street fish vendors and their clientele should be taken into account during the formulation of statutory requirements and legislation applicable to street fish vending. Sanitary regulations and codes of practice for street seafood vending should be drafted using simple non-technical language, and if possible, well illustrated versions of these regulations in both English and Tagalog should be prepared for training purposes and the information disseminated.

Regular training courses on fresh/chilled seafood handling and hygiene should be part of any development programme for street fish vendors organised by the City Council of Metro Manila or Metro Manila Development Authority in co-ordination with the relevant government agencies. This training should be aimed at providing adequate guidance and technical assistance to fish hawkers on proper seafood handling and personal hygiene practices. All stall holders and their assistants who are involved in the preparation and sale of seafood should be required to attend and pass this training course.

Basic technical fields, which may be relevant for training courses intended for street fresh fish vendors, are as follows:

- Introduction to the concepts of freshness, quality, wholesomeness and nutritive value.
- The care of live and fresh fish, handling methods, use of ice, receiving deliveries, quality inspection, storage of live and chilled fish; hygiene and sanitation for fish retailers, selection and application of detergents and disinfectants.
- Quality of fish and quality aspects at retail level; assuring seafood safety at street fish markets; retail display of fish; promotion of fish sales techniques. Avoiding bad marketing practices.
- National and municipal regulations and codes of practice for seafood vending.
- Introduction to business planning and simple economics in fish retailing.
- Equipment and facilities development programmes for street fish vending.

In addition, ready-to-eat seafood vending is a flourishing small-scale business in Metro Manila, which requires adequate training for vendors to improve safety and reduce the risk to public health from poor quality products. Training programmes should focus on improving hygienic conditions at the point of sale, use of potable water, and assuring overall safety of popular street-vended snacks/dishes.

Based on field surveys carried out in Metro Manila, the following street-vended fish snacks/dishes were very popular:

- Fish/squid balls
- Native fish sausage *(quekiam)*
- Mussel soup
- Rice noodles with vegetables and pre-cooked shrimps *(shrimp pansit)*
- Fish/shrimp soup with vegetables *(fish /shrimp sinigang)*
- Deep-fried fish
- Cooked fish with ginger and vinegar *(paksiw na isda)*

2.4.1 Examples of Street Market Outlets in Metro Manila

In most raw food market outlets *(talipapas)* surveyed, the following food items were offered:

- Fresh fish and live shellfish (live mussels and oysters)
- Cured fish (traditional smoked small pelagics and milkfish; dried fish)
- Fermented fish sauce and paste *(patis* and *bagong)*
- Squid/fish balls
- Noodles and rice
- Dressed chicken
- Fresh pork and beef; traditional sausages & frankfurters

- Fresh fruits and vegetables
- Ready-to-eat food and beverages (quail eggs, fish *quekiam*, pineapple juice, *sago gulaman*, roasted peanuts, fish balls)
- Common salt
- Charcoal

Figure 3 illustrates the layout of a typical street market food outlet (*talipapa*) located in Cubao District, Quezon City. At this outlet, about 65 stalls were in operation, of which some 19 stalls were selling fresh and live fish and shellfish (live mussels and oysters) as well as cured fish. Most fresh and live fish stalls were concentrated in the 15th Avenue area and a few were along First Camarilla Street. Considering the significant area occupied by this street market and the variety of food items offered, we can conclude that it is an important outlet in comparison to other markets visited.

The layout of another typical street food market outlet (*talipapa*) located in Project 3, Quezon City, is illustrated in Figure 4. About 18 stalls were there, of which 12 were selling either fresh or live fish and shellfish or smoked fish. Most stalls were concentrated in Molave Street, with some chicken and fresh pork and meat vendors operating in Narra Street. This appears to be a medium size market outlet (with few food items offered) in comparison to other street markets visited. Most vendors interviewed in both street markets indicated that their daily sales were about 50 kg of fresh and/or live fish, 5 – 6 kg of dried-salted fish and 5 – 8 kg of smoked fish.

The preferred source of fresh fish in both street markets was the Farmer's Market in Cubao, and the main source of cured fish and minced fish products was the Divisoria wholesale market.

The street markets in Manila are usually located around public markets or busy corners of main streets. According to all street fish vendors interviewed in the Quezon City area, there is no fixed opening time for street markets, taking into account that they are considered as illegal vendors. However, in most of the markets visited, vendors indicated that they usually operate from 13.00 hours to 20.00 hours, seven days per week. The solid wastes were regularly collected by the street vendors and placed in plastic bags for further disposal. Street vendors were in charge of the cleaning of their working area after market hours.

The basic equipment of a street fish vendor consisted of small wooden tables, a wooden cutting board, trash bin, umbrella, water for washing fish and cleaning the stall area, insulated boxes, weighing scale and plastic display dishes. Most of the smaller stalls were equipped with only secondhand wooden packaging crates as a framework for wooden tops, or round flat bamboo/rattan trays for fish display, weighing scale and cutting boards. The typical sales or table area per seafood retailer would be in the range of 1.5 to 3 m^2. The larger stalls use up more space to keep insulated boxes that may not fit below the wooden tables. The most common material used for manufacturing the round display trays was rattan. In most locations visited, retailers displayed their fish on wooden tops lined with plastic sheets; in some stalls, whole *Acetes* shrimp, small pelagics or squids were displayed in small plastic dishes (on top of the tables) and sold by the dish (volume).

Figure 3: Layout of a Typical Street Food Market in Metro Manila (Cubao District, Quezon City)

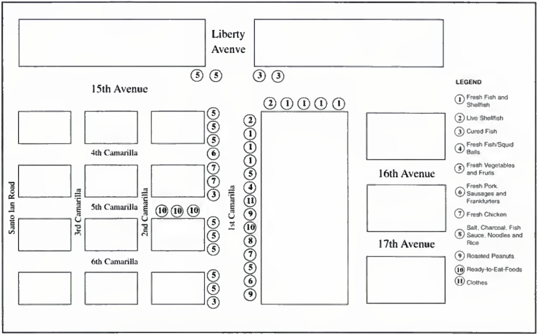
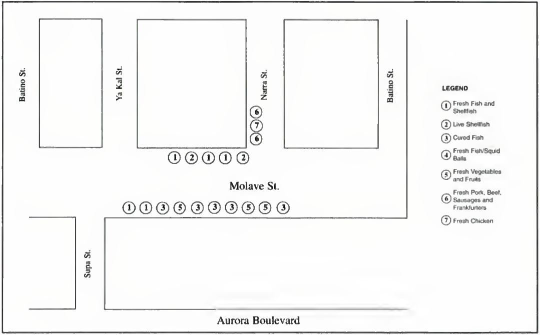


Figure 4: Layout of a Typical Street Food Market in Metro Manila
(Project 3, Quezon City)



Some vendors, operating in the outskirts of Metro Manila, were offering live freshwater fish and shellfish, mainly snakehead, catfish, mussels and oysters. Basic equipment for live fish sales consisted of metal tubs or plastic bins filled with water, weighing scale, round display trays (rattan) and chopping boards. Mussels and oysters were displayed on round display trays and kept moist with regular sprinkles of seawater. Snakehead and catfish were displayed in metal tubs or plastic bins filled with freshwater. In general, green mussel was the predominant species offered in live form; this was available in most of the street markets visited. According to most vendors, the sales of mussels and oysters are regularly affected by red tide. As a result, the Government sometimes imposes a complete ban on the harvesting and sales of these bivalves in the interest of public safety. These bans negatively affect marketing operations and the livelihood of street fish vendors specialised in live shellfish vending.

2.5 Improved Equipment and Technologies for Street Seafood Vending

In contrast to the considerable emphasis on modern food vending equipment in outlets which cater to the middle/high income consumers, very little consistent effort is directed for the benefit of low-income consumers. It remains a fact that much technology and expertise exists locally today, which, if adapted to the needs of the low-income sector, could play an important role in improving and streamlining the safety and quality of ready-to-eat street seafood. Among the major deficiencies observed during field surveys of traditional street fish/squid balls vendors in selected areas of Metro Manila, were the lack of basic facilities (running potable water for hand washing, cleaning worktops and utensils), and limited access to refrigerated/chilled storage for their daily stock of fish balls.

A successful pilot scheme on food carts for street food vending sponsored by the Food and Nutrition Research Institute in co-ordination with other local agencies/institutions was implemented in San Juan, Metro Manila and Los Baños, Laguna during 1996. It provided improved food cart prototypes to selected street food vendors on a "rent-to own" basis and a flexible payment scheme which considered the prevailing street vendor's payment capabilities. The prototypes were locally constructed and the cost ranged from P. Peso 3,500 to 4,200. This scheme was aimed at field testing two models for integrating the street food system into feeding operations in selected urban schools. However, during the field work, there was insufficient technical information available on the design and materials used for the construction of these improved food cart prototypes to allow a proper analysis.

2.5.1 Improved Pushcart for Retailing Fish/Squid Balls and Native Fish Sausage

A good example of improved equipment locally developed for the retail of fish/squid balls and native fish sausage (*fish quekiam*) was identified by the field survey team in Quezon City area. This improved pushcart (locally known as *carreton*) was an initial attempt by a local propane gas company to focus attention on development of low-cost equipment (see next section). It was technologically-based and motivated by a desire to improve the traditional preparation and retailing habits of local vendors and as well as promote the safe use of propane gas. In Metro

Manila, street vendors of fish balls traditionally prepare and retail their products using poorly designed wooden pushcarts. According to the improved pushcart operator, the fish balls and *fish quekiam* stock is kept in a home refrigerator. During trading hours she uses an insulated box to store the fish/squid balls and *fish quekiam*.

Street vendors should be advised not to store fish balls for more than three (3) days under chilled storage conditions and to cook them thoroughly before selling them to their clientele. A research study[7] suggested that fish balls were included among the ready-to-eat food items sold by Metro Manila's street food vendors, which were associated with the risks of cholera infection. However, that research study concluded that only *pansit* (rice noodles with shrimp, meat and vegetables), mussel soup and the absence of piped water at home remained as risk factors associated with cholera transmission in Metro Manila. Infrastructure requirements for fish balls vending to ensure that they are hygienic and safe, will depend on whether the fish balls were prepared at the vendor's home or purchased semi-prepared (ready-to-fry) for completion at the point of sale. According to the results of the field surveys, most of the fish/squid balls were processed elsewhere and purchased at wholesale markets by vendors. At wholesale level, it was observed that most fish/squid balls and *quekiam* were adequately packed in plastic bags, and kept either chilled or frozen. Therefore, the main concerns were the storage conditions of fish/squid balls after purchase and during the time of storage. Refrigeration/chilled facilities for traditional street seafood vendors were very limited and were not normally encountered among these vendors during field surveys. However, block ice was very accessible in Metro Manila; it is widely used by street vendors to cool soft drinks and for preparation of a traditional delicacy called *halo halo* (crushed ice mixed with chopped fruits, milk and ice cream).

2.5.1.1 Operation of the Improved Pushcart

The improved pushcart prototype was constructed locally by a propane gas company, using stainless steel sheets for the body and a stainless steel angle frame. The heating system consisted of one cooking stove, constructed of angle iron frame and fitted with one burner and gas storage tank with a manual safety on-off valve. The main body was attached to a bicycle with one turnable and two fixed wheels. A canvas cover with a metallic pipe frame was fixed to the main body for protection against rain and sunshine. This pushcart has significant advantages over the traditional *carreton*, which uses kerosene-cooking stoves for frying fish balls and are considered more prone to accidents due to malfunction. It had a well-designed gas cooking stove with a protective surface against strong draughts, thus avoiding disturbed combustion. The manufacturer has paid particular attention to the necessity for regular inspection and maintenance of this equipment, particularly of safety devices, in order that they may be relied upon to give adequate service to the user. The gas storage tank was located far away from the heated area of the pushcart and it was easy to detect any possible gas leaks. It also included adequate storage space below the worktop which was used to keep an insulated box for chilled storage of fish balls/squid balls during the trading day.

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[7] "Cholera in Metropolitan Manila: foodborne transmission via street vendors" Bulletin of the World Health Organization, 1994, 72 (5), 745-749, by Lim-Quizon, M.C., et. al.

Traditional pushcarts are constructed in wood, without adequate chilled storage facilities (insulated boxes), as well as lacking a suitable worktop area which can be easily cleaned and sanitised. During the trading day, fish balls are kept at ambient temperature and, as a result, they deteriorate in quality and value. The use of improved pushcarts, it was suggested, would improve returns and reduce financial risks to the fish balls vendor by:

i) Increasing marketing range

ii) Maintaining the fish balls in high value condition longer, thus reducing losses and spoilage.

iii) Reducing the risk to public health from poor quality products; improving hygienic conditions at the point of sale; improving the safety of street-vended fish/squid balls and native fish sausage (*fish quekiam*).

iv) Improving clientele loyalty and encouraging repeat purchases

This street seafood enterprise can be characterised as small-scale, requiring relatively simple cooking and administrative skills, a small amount of initial capital to start the business and only basic facilities at home for storage of raw materials and preparation of sauces. The main capital input required comprised the purchase of the improved pushcart; this was done through a special credit arrangement with the propane gas company, with a small down payment and regular monthly instalments. This scheme was initially aimed at assisting the development of small-scale fish balls businesses among family members of the propane gas company's employees, thus ensuring adequate repayment. The interviewed owner and operator of the improved pushcart can be characterised as a casual street vendor selling fish balls as a supplement to other activities.

The operations of this small-scale street seafood business include the following:

i) Forecasting and planning the daily operations. From the forecasting (based on the experience of the vendors) comes the planning regarding the number of raw fish/squid balls and native fish sausages (*fish quekiam*) to carry daily; how much freshly made sweet and sour sauce to prepare; how many staff will be needed and when;

ii) Organising all needs including regular wholesale purchases of fish/squid balls, native fish sausages (*fish quekiam*), ingredients for sauce preparation and non-returnable packaging materials at Divisoria wholesale market or making arrangements with a wholesaler for regular deliveries of purchase orders (the squid balls & *quekiam* vendor interviewed indicated that she had an arrangement with a wholesaler for deliveries twice a week). Organising for adequate chilled storage of raw materials to avoid spoilage. Arranging practical training in the use of equipment and cooking techniques. Cleaning schedules for all kitchen utensils and the pushcart.

iii) Controlling of staff and products and preventing pilferage as well as improving performance. It is important to check that fish/squid balls and *fish quekiam* is of the right standard, (that is to say the correct quality and quantity); checking to prevent waste and that the staff operates the cooking stove properly. Checking that the cooking times are correct, avoiding undercooking or excessive shrinkage due to overheating. In general, vendors start preparing fish/squid balls or *quekiam* once the clientele has placed their orders; tried products are normally not kept on display. Sweet and sour seasoned vinegar and traditional sauces are prepared at home at least every two days. For each trading day, small quantities of fresh sauces are placed in plastic dispensers or glass bottles and the leftovers are removed at the end of the day.

iv) Understanding the preferences, eating habits, purchasing behaviour and needs of the consumers to encourage repeat purchases. Therefore, lastly and perhaps most important, a good knowledge of the target market is a great asset, to be able to formulate simple marketing tactics. A brief analysis of the competition, namely small low-cost restaurants (locally known as *carinderia*) and fast food chains is of some importance. For example, the apparent declining sales in restaurants and fast food chains in Metro Manila since 1998 (due to the economic crisis and consequently lower consumer demand) had positive effects on the sales of street food. As we can easily figure out, the main target market comprises the younger sector of the population, including students and workers looking for low-cost, tasty and convenience snacks. We must realise that lower income consumers (D and E socio-economic class*) represent about 65 – 70 percent of the population in Metro Manila and they may be looking for low-cost seafood products. Small-scale enterprises offering inexpensive seafood products should consider marketing strategy clearly identifying their seafood products as meant for price-conscious consumers.

v) As a marketing tool, the sales of soft drinks and the traditional delicacy locally known as *halo halo*, helps to provide consumers with a wider variety of products, which combine well with the main seafood products offered. In the case of the improved pushcart operator interviewed, she mentioned that she could offer these additional products, considering the fact that she currently places her selling point in front of her home, placing some wooden benches for consumers to sit and enjoy her products. The *halo halo* snack is prepared at her kitchen, under good hygienic conditions using her domestic refrigerator (with a freezing compartment to keep ice) to store all ingredients. The operator's home had a well-designed kitchen with potable water supply and suitable facilities for hand washing, and washing dishes and utensils. In addition, suitable sanitation and waste management facilities were observed at her selling point. Disposable paper plates and bamboo sticks were used for retailing fish/squid balls and *quekiam*; returnable glass cups used for retailing *halo halo* were well cleaned with running water and detergent and looked tidy and clean.

The estimated investment costs of the improved pushcart prototype for street vending fish/squid balls and *quekiam* are shown in Table 10. The major investment cost consists of the pushcart itself which is about US$ 367, representing 95 percent of the total investment cost. The operator of this improved pushcart indicated that her daily gross sales was on average,

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* There are several socio-economic classifications of Filipino homes being used; mostly classifying homes into four groups, namely: class A and B (upper class), C1 and C2 (middle class); D (lower class) and class E (extremely low class).

P. Peso 500 to 600 and a daily gross income of P. Peso 300; currently she was only operating 4 – 5 hours/day and 5 days/week. A daily gross income when operating 8 hours/day was estimated to be about P. Peso 350 to 480. Average retail prices of squid balls and *quekiam* were P. Peso 2 and P. Peso 1 per piece respectively. The average daily sales were 2 – 3 kg of fish balls and 3 – 4 kg of *quekiam*. Her target market consisted of mainly middle class consumers (but also included some D class consumers), in particular, students and housewives, as well as government workers.

Based on the assumption of an average daily gross income of P. Peso 400/day and operating 7 days/week, the expected monthly gross income would be P. Peso 11,200. After accounting for labour costs, electricity, propane gas, ice, raw materials and equipment depreciation at P. Peso 4,800, it is expected that monthly net revenues of the improved pushcart would be about P. Peso 6,400. Assuming that a loan is taken for capital expenditure on the improved pushcart, the repayment period would be about 10 months, with monthly instalments of P. Peso 1,500.

Table 10: Investment Costs for Imported Pushcart

Description of Item	Quantity	Cost (P. Peso)
Improved pushcart, with stainless steel body, including propane gas stove.	1	15,000
Frying pan	1	350
Plastic container with lid (trash bin)	1	50
Plastic dispensers for sauces	2	40
Disposable paper plates:		
Small size	1 pack (50 pieces)	14
Medium size	1 pack (50 pieces)	27
Raw materials (stock for 1 day):		
Squid balls *Quekiam*	3 kg 4 kg	240
Vegetable oil	5 litres	125
Propane gas (for 10 days)	5 kg	85
Bamboo sticks	50 pieces	20
Small insulated box (expanded polystyrene)	1	84
		Total: 16,035

Challenging conventional wisdom about the informal sector, this example documents street fish and fishery products vending as an economic activity that produces an income ranging from minimum wage to higher than average income depending on the ownership, working schedules and market strategies used. It is important to note that most successful street ready-to-eat fish/squid balls vendors work in the trade for a lifetime, but there are also a few casual street vendors selling as a supplement to other activities.

The critical factors affecting the acceptability of the improved pushcart prototypes in gaining acceptance among street seafood vendors include the following:

i) Provision of adequate credit and flexible/affordable payment terms, considering the limited financial capabilities of street seafood vendors. These schemes should also emphasise the specific benefits of improved technologies and equipment. In simple words, it should explain what the vendors would miss if they don't own the improved equipment

ii) Development of improved prototypes suitable for the different type of seafood snacks/dishes being offered regularly; these would need to be simple, cost effective and suitable to local conditions

iii) Provision of training programmes to street seafood vendors on improved hygienic conditions and safety of ready-to-eat seafood products

iv) Provision of adequate programmes to formalise and monitor the commercial activities of street seafood vendors aimed at orderly integration and development of street seafood vending

v) Provision of consumer education programmes to create awareness on the nutritional quality and safety of street seafood vending under the proposed improved scheme.

Although the use of traditional pushcarts will probably continue amongst the poorer street fish balls vendors, greater local research and adaptation would be required to result in the introduction of improved designs, alternative materials and better features to upgrade food safety and sanitation. For example, an alternative form of pedal-powered equipment known as the Oxtrike could be considered as a possible improvement. Its three-speed gearbox and differential drive overcomes some of the design deficiencies of traditional tricycles. This modern tricycle is specifically designed for carrying loads (150 – 300 kg) and could be adapted to improve traditional pushcarts retailing fish balls. Benefits that would result from using improved pedal-powered equipment and pushcarts include the following:

- Less time and effort may be required to move a mobile cart for vending fish balls. In addition, the efficiency of street vending may be improved by making fish balls available to consumers at the right time and place

- Domestic manufacturers, using local resources and materials can make low-cost improved pedal-powered equipment and pushcarts. In addition, the manufacture and maintenance of this low-cost equipment can provide employment and their use will provide safer ready-to-eat fishery products at a low investment cost.

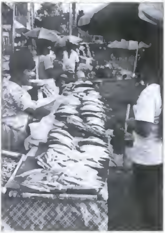

Figure 5. Fresh fish display at a street fish-retailing stall. Quezon City, Metro Manila.

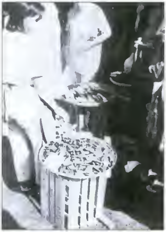

Figure 6. Typical display of live mussels at a busy street food market. Metro Manila.

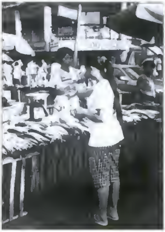

Figure 7. Typical display of fresh fish at a busy street corner. Quezon City, Metro Manila.

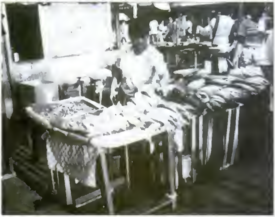

Figure 8. Overall view of a typical street fish-retailing stall. Metro Manila.

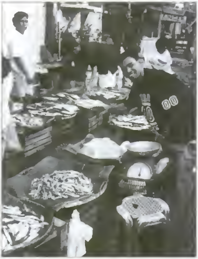

Figure 9. Overall view of a street fresh fish retailing stall using traditional bamboo display trays and banana leaves. Quezon City, Metro Manila.

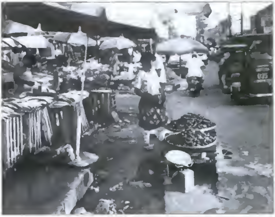

Figure 10. Typical display of live mussels using traditional bamboo trays in a busy street, Metro Manila.

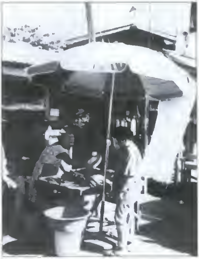

Figure 11. Improved portable display table used for fish retailing at a street food market outlet, San Pedro, Laguna, Metro Manila.

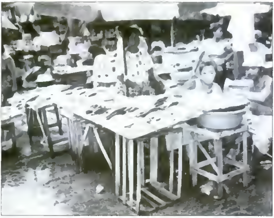

Figure 12. Fresh fish display using slanted wooden platforms at a street food market. Quiapo, Metro Manila.

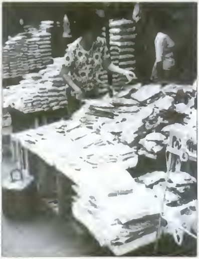

Figure 13. Overall view of a typical large-size street stall selling dried-salted and smoked fish at a busy street. Quiapo, Metro Manila.

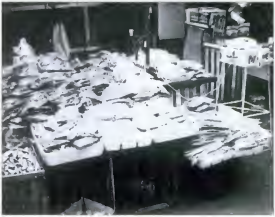

Figure 14. Display of dried-salted and smoked fish in a street food market stall. Quiapo, Metro Manila.

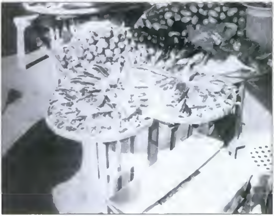

Figure 15. Display of dried-salted and smoked fish using traditional trays at a street food market. Quezon City, Metro Manila.

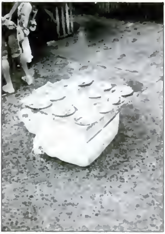

Figure 16. Typical display of fresh fish on small dishes at a street food market. Metro Manila.

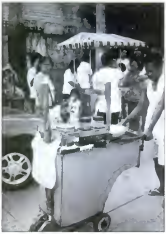

Figure 17. Traditional wooden pushcart used for street vending squid and fish balls. Quezon City, Metro Manila.

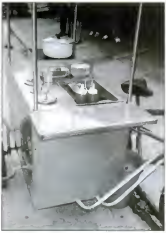

Figure 18. Overall view of an improved pushcart equipped with gas stove for street vending of *quekiam*, squid and fish balls. Quezon City, Metro Manila.

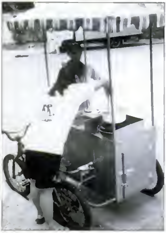

Figure 19. Side view of the improved pushcart, equipped with a bicycle. Quezon City. Metro Manila.

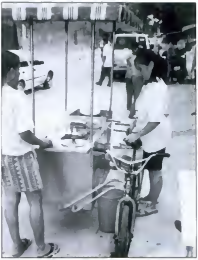

Figure 20. Deep-frying of squid and fish balls using the improved pushcart. Quezon City, Metro Manila.

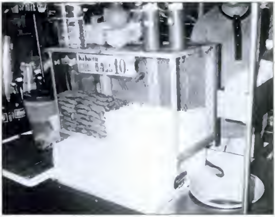

Figure 21. Display of *fish quekiam* and squid using an improved stationary pushcart operating in a busy street. Quiapo, Metro Manila.

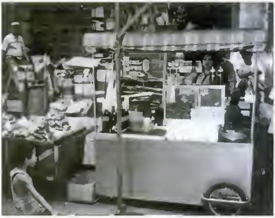

Figure 22. Overall view of an improved stationary pushcart vending *fish quekiam* and squid balls. Quiapo, Metro Manila.

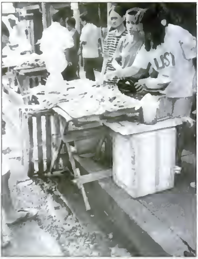

Figure 23. Street fish vendor's folding trestle table used for fresh fish retailing. Metro Manila.

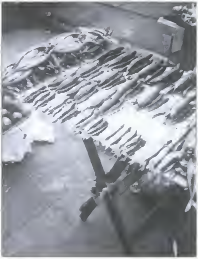

Figure 24. Street vendor's folding trestle table used for dried-salted and smoked fish retailing. Metro Manila.

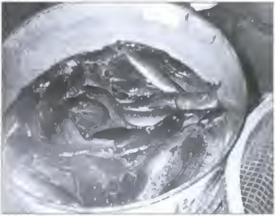

Figure 25. Galvanised iron round containers ("bañeras") used for live fish storage, marketing and distribution. Navotas, Metro Manila.

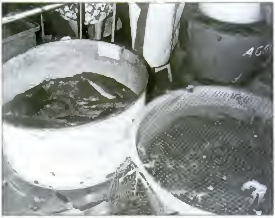

Figure 26. Typical wholesale display of live catfish using traditional "bañeras" with a nylon mesh cover. Navotas FPC, Metro Manila.

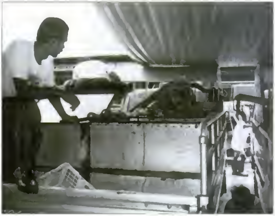

Figure 27. Side view of a live fish storage system mounted on a truck used for live milkfish distribution. Navotas, Metro Manila.

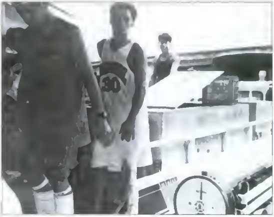

Figure 28. Typical live fish unloading operations from a vivier truck to the wholesale auction hall. Navotas FPC, Metro Manila.

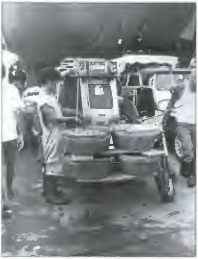

Figure 29. Front view of the loading operations of fresh fish in "bañeras" onto a low-cost transportation tricycle. Navotas FPC, Metro Manila.

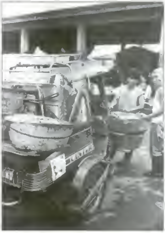

Figure 30. Side view of a tricycle loaded with fresh fish for distribution to retail markets. Navotas FPC, Metro Manila.

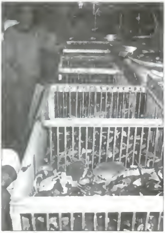

Figure 31. Display of live mangrove crabs using locally made stainless steel cages. Seaside fish market. Metro Manila.

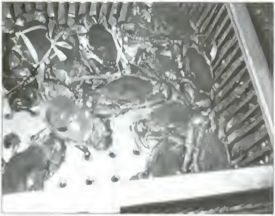

Figure 32. Overall view of the storage of live mangrove crabs at a specialised retail outlet. Seaside fish market, Metro Manila.

3. CASE STUDY: KUALA LUMPUR

3.1 Introduction

Kuala Lumpur supports a substantial market for live, fresh, frozen and cured fish and canned fishery products. Under the administration of the Kuala Lumpur City Council, the capital city of the country is centrally located on the West Coast of peninsular Malaysia. Covering an area of 243 square km, in 2000, Kuala Lumpur City has an estimated population of 1.6 million (according to latest estimates, the total projected population of Malaysia[1] for 2000 is about 22 million). Table 11 shows the distribution of Kuala Lumpur's population by ethnicity. Under the Local Government Act 1976 (Act 171), all laws related to local government were revised and consolidated. In February 1972, Kuala Lumpur was granted local autonomy, conferred city status and declared a Federal Territory in 1974. Under Parts VII and IX, Public Places, Food, Markets, Sanitation and Nuisances (Local Government Act 1976) the Kuala Lumpur City Hall is in charge of basic city sanitary services, enforcement of inspection of food products and urban sanitation. It is also in charge of policy formulation and supervision of wholesale and retail food markets and street food vending.

Table 11: Kuala Lumpur's Population, by Ethnicity, 1998

Ethnic Group	Percentage (%)
Malay	38.4
Chinese	44.7
Indian	11.8
Others	1.3
Non-Citizens	3.8

Source: Kuala Lumpur City Hall

ASEAN countries, particularly the Philippines, Singapore and Malaysia, offer a strong regional seafood market with significant imports. In 1997, FAO reported an apparent annual per capita fish supply of 52.5 kg for Malaysia. Currently Malaysia, the Philippines and Singapore have the highest per capita supply of fish in the ASEAN[2] region. A breakdown of the annual per capita supply of fish for Malaysia in 1997 is shown in Table 12, with pelagic fish constituting the biggest portion, followed by other marine fish. The total fish production was 1,276,282 metric tonnes, including aquaculture production. Malaysia is by far a net importer of seafood although exports are substantial. The main export products are high value items such as chilled, cured, canned and frozen fish, molluscs, shrimp and cephalopods. In 1997, total exports and imports of seafood were about 236,643 metric tonnes and 374,893 metric tonnes, respectively. Main import products included pelagic fish (70.3 percent), other marine fish (12.7 percent) and crustaceans (12 percent). Much of the imported pelagic fish was used as raw material for the local canning industry.

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[1] Based on the total midyear population data for the year 2000, international database of the US Bureau of the Census, International Programs Center. (**http://www.census.gov**).

[2] Association of Southeast Asian Nations (ASEAN), with the following member countries. Brunei Darussalam, Cambodia, Indonesia, Laos, Malaysia, Myanmar, the Philippines, Singapore, Vietnam and Thailand.

In 1998, Malaysia had an average per capita gross domestic product (GDP) of US$ 3,304. Only Singapore and Brunei Darussalam had higher per capita GDP among Southeast Asian countries. However, the recent Asian financial crisis caused a deceleration in GDP growth, increases in unemployment, lower income levels and weakening of trade accounts. The Federal Government has imposed capital controls to protect the national currency while cutting interest rates to stimulate the economy. In addition, several economic adjustments have been made to combat rising unemployment. Financial recovery has begun.

Table 12: Fish per Capita Supply (1997)

Food Item	Annual per Capita Supply (kg/year)
Freshwater fish	1.6
Demersal fish	7.5
Pelagic fish	20.1
Marine fish, other	13.7
Crustaceans	5.2
Cephalopods	2.0
Molluscs, other	2.4
Total fish	**52.5**

Source: FAO Food Balance Sheets, 1994-97

Table 13 shows the national meat and eggs per capita supply for 1997. When comparing meats with seafood products, the highest per capita supply item was poultry meat (including chicken, duck and other birds) with 34.78 kg/year, followed by pelagic fish with 20.1 kg/year.

Table 13: Meats and Eggs, per Capita Supply (1997)

Food Item	Annual Per Capita Supply (kg/year)
Beef and Veal	5.23
Mutton and Goat Meat	0.62
Pork	11.23
Poultry	34.78
Other meat	0.02
Eggs	13.97

Source: FAO Food Balance Sheets, 1994-97[1]

3.2 Fish Distribution Channels

Current apparent consumption/supply levels of about 52.5 kg per capita place Malaysia among the highest seafood consuming nations in the world. Both freshwater and marine fish and fishery products are regularly traded in Kuala Lumpur's domestic seafood market. Fish and fishery products are staple foods, and are the main source of animal protein for virtually all ethnic and income groups.

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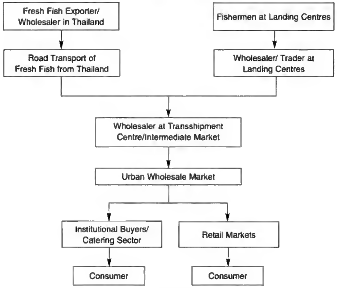
[1] Based on FAO statistical database (http://www.fao.org).

Fresh seafood is landed at several centres along the coastline of Peninsular Malaysia and is marketed by private fish traders/wholesalers. Much of it is traded through private contracts at negotiated prices and to a lesser extent, public auction. In addition, supplies originating from Thailand are transported by road to urban centres on the West Coast of Peninsular Malaysia. The distribution of fresh seafood in peninsular Malaysia shows a strong flow southward to main urban centres, in particular to Kuala Lumpur and Singapore. Seafood reaches consumers in Kuala Lumpur through a multi-level system, which may involve at least four transactions before the fish or fishery product is purchased by consumers in a public fish market or supermarket, or eaten at a restaurant/food stall. The channels of distribution incorporate locally caught and processed seafood, live and chilled cultured species and frozen locally processed and imported items from the region. Figure 3 illustrates the marketing channels for fresh seafood in Peninsular Malaysia. Kuala Lumpur's supermarket chains often obtain supplies from direct importers or distributors of frozen and canned seafood products, which makes possible a shorter distribution chain.

Figure 33: Simplified Marketing Channels for Fresh Seafood in Peninsular Malaysia


Fresh Fish Exporter/ Wholesaler in Thailand
Fishermen at Landing Centres
Road Transport of Fresh Fish from Thailand
Wholesaler/ Trader at Landing Centres
Wholesaler at Transshipment Centre/Intermediate Market
Urban Wholesale Market
Institutional Buyers/ Catering Sector
Retail Markets
Consumer
Consumer

The Fisheries Development Authority of Malaysia (LKIM) is in charge of the following functions:

- Management and operation of fish marketing landing complexes
- The promotion and development of fishery enterprises and fish marketing
- The registration and supervision of Fishermen's Associations and Co-operatives
- The promotion and development of activities to upgrade the socio-economic status of fishermen and the provision of credit facilities for fish production.

There is a significant domestic live fish trade which is handled by mainly private wholesalers, who operate small trucks (with tanks and aeration systems), collecting live freshwater fish (tilapia, catfish, snakehead) produced by aquaculture farms. Domestic live shellfish trade comprises molluscs such as cultivated green mussel (*Perna viridis*), cockles/clams (*Anadara spp.* and *Arca spp.*), in particular blood cockle (*Anadara granosa*) and oyster (*Crassostrea spp.*); crustaceans include mangrove crabs (*Scylla spp.*). These live shellfish are regularly distributed in Malaysia using sea and road transport; supplies come from mariculture enterprises and small-scale fisheries. Most of the production of oysters, blood cockles/clams and green mussels are sold alive and a relatively limited proportion is sold as shucked flesh.

There is also a significant domestic and export trade of live cultivated seabass (*Lates calcarifer*) and to a lesser extent, groupers, with supplies coming mainly from cage culture. Singapore is the main export market for live seabass, which is transported by road in trucks equipped with tanks and aeration. Current ex-farm prices of pond-cultivated live seabass are about US$ 2.6 to 3.9/kg according to size; average market size of cultured seabass is about 500 to 700 g/piece. The most important domestic market channel for cultured seabass is the catering sector; according to latest estimates [4], about 3,000 tonnes of cultured seabass are consumed in Malaysia annually. Chilled/fresh cultured seabass is regularly offered through supermarket chains and public food retail markets.

Table 14 shows the price range and average wholesale prices of selected seafood at the Kuala Lumpur wholesale market during February/March 2000. Of the fresh/chilled fish species, white pomfret and threadfin fetched the highest prices. Fish is usually size- graded in three categories (large, medium and small). Shrimp species were among the most expensive seafood traded; and were graded according to the number of pieces per kg; most common sizes were 35 – 40 pieces/kg, 40 – 60 pieces/kg and > 60 pieces/kg.

Malaysia has becoming increasingly reliant on imports of frozen fish to satisfy the local fish canning industry demand. Canned fish, in particular mackerel and sardines, which are locally manufactured, are easily found in supermarkets, public markets and small grocery retail outlets. Some canned fish products from Thailand are also offered in the domestic market. Many of the retail outlets sell a wide variety of canned seafood, fish/squid snacks and cured fish. Supermarket chains are considered to have the largest share of the canned seafood retail market. Popular canned seafood packs include the following:

- Sardines in tomato sauce, in cylindrical cans.
- Mackerel in tomato sauce or in vegetable oil, in round cans.
- Tuna in oil, solid, chunk and grated packs, in round cans with net contents of 180 g.
- Cuttlefish/squid in sauces, in round cans.
- Anchovy in *sambal* (chilli) sauce, in cylindrical cans.

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[4] Markets for cultured grouper and other marine finfish, by Sudari Pawiro (INFOFISH).

Table 14: Average Wholesale Prices of Selected Seafood in Kuala Lumpur
Period: February/March 2000

Species	Wholesale Price (M. Ringgit[5]/Kg)
Indian Mackerel (*Rastrelliger kanagurta*)	3.6 – 7.2 (5.3)
Spanish Mackerel (*Scomberomorus spp.*)	7.0 – 12.5 (10)
Threadfin (*Nemipterus spp*)	7.3 – 23.0 (19)
Seabass (*Lates calcarifer*)	7.6 – 13.5 (10.5)
Red snapper (*Lutjanus spp.*)	8.3 – 14.0 (10.8)
Brown spotted Grouper (*Epinephelus chlorostigma*)	7.3 – 17.0 (11.6)
Red Grouper (*Cephalopholis sonnerati*)	8.5 – 23.5 (14.8)
Black Pomfret (*Formio niger*)	7.5 – 13.0 (10.3)
White Pomfret (*Pampus argenteus*)	14.0 – 36.5 (25.5)
Black Tiger Shrimp (*Penaeus monodon*)	23.5 – 45.5 (35)
White Shrimp (*Penaeus indicus*)	24.5 – 47.0 (36)

Source: INFOFISH Trade News

3.3 Kuala Lumpur's Retail Fish Market Sector

There are 78 public food markets, the Selayang food wholesale market being one of Kuala Lumpur's main sources of fresh produce, including seafood.

The Kuala Lumpur urban area is home to a variety of retail establishments offering live, fresh, frozen, cured and canned seafood to consumers. The range of shopping options include public retail markets, supermarkets and street outlets, which offer a wide selection of live fish, fresh fish, frozen and canned fishery products as well as cured and fermented fish. Public markets and street fish hawkers currently hold a significant share of the retail market of chilled and live fish, as well as fermented and cured fishery products. Large supermarket chains offer mainly canned and processed seafood (including fish/shrimp crackers, shrimp paste, fish sauce, fish snacks, boiled-dried anchovy and dried fish). There is a strong preference by consumers to regularly shop for chilled/fresh fish at public retail markets and to a lesser extent, at street hawker stalls. Boiled-dried anchovies is a well-established product in the domestic market and was available in most retail outlets visited; according to some retailers, its demand is strong and steady the year-round.

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[5] In February 2000, the rate of exchange was US$ 1.00 equal to 3.8 Malaysian Ringgit.

The most popular product form is whole fresh fish and the species most in demand are Spanish mackerel, Indian mackerel, squid, threadfin bream, red snapper, grouper, sardine and shrimp. In a market where culinary traditions regard intrinsic characteristics of fresh fish as important, frozen products have to overcome consumer resistance. Usually, unsold fish is frozen and offered for sale the next day, at which time it fetches lower prices in comparison with fresh fish. However, frozen imported seafood (including hoki fillets and shucked mussels) is sold at some fast food restaurants; according to the restaurant management, improved availability and advertising campaigns have raised acceptance levels for frozen products among consumers in the catering sector. Cultured fish such as seabass, snakehead and catfish are well accepted by most ethnic and income groups.

Table 15 shows comparative retail prices for fresh fish at selected street seafood markets and public markets in Kuala Lumpur. In general, retail prices at street seafood markets were slightly lower than public markets with a price difference range of RM (Malaysian Ringgit) 0.5 to 3 per kg. However some products like Spanish mackerel, round scad, threadfin bream and sand velvet shrimp were at the same price level.

Table 15: Comparative Retail Prices of Fresh Fish at Selected Street Seafood Markets and Public Markets in Kuala Lumpur

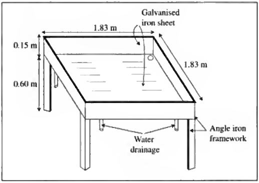
Species	Street Seafood Market Price (M. Ringgit/kg)	Public Market Price (M. Ringgit/kg)	Price Difference (%)
Red Snapper	8 – 12	13.0	+3
Mangrove Snapper	8.0	8 – 9	+0.5
Squid	6 – 9	8 – 10	+1
Spanish Mackerel	13 – 15	14.0	0
Round Scad	5.0	4 – 6	0
Catfish (Live)	n/a	4.0	—
Hardtail Scad	4 – 5	5.0	+0.5
Yellow Striped Trevally	4 – 5	5.0	+0.5
Indian Mackerel	5 – 6	7.0	+1.5
Skipjack (small size)	3.0	3.0	—
Silver Pomfret	16.0	15 – 16	– 0.5
Black Pomfret	15.0	15 – 17	+1
Chinese Pomfret (small)	9.0	n/a	—
Tilapia (small)	3.0	n/a	—
Tilapia (medium)	3.5	n/a	—
Carps	7.0	n/a	—
Threadfin Bream	7.5	7.5	0
Mangrove Crab	13.0	13.5	+0.5
Sand Velvet Shrimp	25.0	25.0	0
Giant Freshwater Prawn	19.5	20.0	

Source: data from field market surveys carried out by the author and counterparts

At most public markets, there are full-service seafood stalls in charge of taking and preparing orders from consumers. The preparation may include weighing a specific quantity of fish or shellfish, gutting, cleaning or cutting a whole fish to the desired size or product form. Orders are then wrapped in plastic bags.

Live fish and shellfish, including catfish, snakehead and blood cockles, are well-established products in the domestic market. The fish are kept in aerated tanks/aquaria, or simple water tubs or display baskets (for blood cockles) – this is a traditional and attractive marketing approach found in many public retail markets. Figure 34 illustrates a typical low-cost fish display table used for marketing of live catfish at public retail markets. Live catfish retailers indicated that average sales range from 60 – 70 kg/day; however one retailer indicated an average sales volume of 150 kg/day. Average retail prices of live catfish and eel were RM 4 and 15 per kg respectively. The basic equipment of a typical live catfish retailer consisted of one (1) plastic tank with a storage capacity of 500 kg of live catfish, weighing scales, chopping boards, plastic containers and one display table. Reportedly, the catfish can be kept alive for up to 7 days and with about 2 percent losses. Sales through the catering sector are also an important outlet for seabass, catfish and snakehead. Some restaurateurs indicated strong consumer preference for catfish, seabass and snakehead, either traditionally steamed or fried with vegetables. Blood cockles are also very popular in restaurants, steamed or sautéed in curry sauces.

Figure 34: Typical Low-cost Display Table for Retail Marketing of Live Catfish



The retail market for minced fish-based products includes fish balls, squid/cuttlefish balls, fish cakes, fish fingers and surimi analogues. In some street markets it was noticed that traditional small-scale production of minced fish paste was carried out regularly. This product was offered at some street markets, in particular those catering to the ethnic Chinese population. In addition, minced fish-based dried fish/shrimp crackers (locally processed and imported) were also offered. Public retail markets and supermarkets currently offer a variety of traditional minced fish products and surimi-based products. Traditional fish and squid balls are consumed in soups, mixed with vegetables or deep-fried.

Besides the above-mentioned minced fish products, value-added fishery products such as breaded shrimp and fish fillets are locally processed and marketed. In addition, dried squid and soaked/processed squid (*sotong*) are popular with consumers. Despite substantial local production of squid, some fresh/chilled squid/cuttlefish and dried squid is imported to meet domestic demand.

3.4 Street Food Hawkers in Kuala Lumpur

Street food hawkers in Kuala Lumpur, in particular those selling fresh and ready-to-eat seafood, are considered to be catering to the low-income consumers. According to current data from the City Hall, Department of Hawkers and Petty Traders, the total number of licensed street hawkers is about 34,593. However, it is recognised that about 12,000 unlicensed street hawkers are currently operating in the city[6]. Some 35 percent of the total number of street hawkers are involved in retailing ready-to-eat foods and beverages, raw food (fruits, vegetables, seafood, poultry) and native sweets and delicacies. According to the type of stall, hawkers in general are categorised as follows:

a) With static stalls
b) With stalls in marketplace
c) With stalls in hawker centres/food centres
d) Locked-up stalls
e) With stalls in open market place/night markets
f) With kiosks
g) With stalls in office buildings
h) Seasonal hawkers (festivals/cultural events)

Since the formulation of the National Action Plan on Hawkers in 1990, a comprehensive policy has been in effect to tackle the social and economic problems associated with street hawkers both at rural and urban levels. Its implementation includes the provision of funds to support credit schemes and training programmes for street hawkers to improve their facilities. In addition, the sanitary aspects of street food trading were to be addressed. Unfortunately, during the survey work, it was not possible to collect any available data on the level of implementation.

The main legislations formulated by the Federal and municipal authorities related to street food vending included regulations/laws which required hawkers to apply for registration/ licensing, follow codes of practices, undergo periodic medical examinations, and follow training and inspection procedures. In addition, City Hall has implemented measures to try to control the number of hawker licenses; since 1996, a complete freeze in the issue of new licences began. However, this drastic measure apparently has not been totally effective, as more street hawkers have appeared. The authories acknowledge the following problems associated with the increase of the street hawker population:

a) Inappropriate location and poorly designed/non-uniform stalls

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[6] Development of street food activities - Kuala Lumpur experience by Zainol Ariffin bin Pawanchee, 1999

b) Inadequate basic amenities; wastes are not properly disposed of
c) Poor management and low personal hygiene habits
d) Improper food handling practices; lack of adequate health awareness.

Street fish hawkers currently play a significant role as fresh/chilled seafood suppliers in Kuala Lumpur; however, there is no detailed data on the number of such hawkers operating in the city. The main characteristics of fresh/chilled seafood street hawkers include the following:

- Temporary stalls are set up in busy streets/around public markets during certain times of the day. It is the simplest type of market available, making use of existing road infrastructure and with a low level of investment. In general, it is easy to relocate facilities/equipment to another site. When operating in areas surrounding public/private markets, they compete with the permanent fish retailers. These vendors usually operate at fixed and regular locations, mainly using portable equipment, umbrellas and tent-type stalls

- Fresh seafood are carried in plastic boxes or insulated boxes from the wholesale markets to the street marketing areas using taxis, public transportation and private cars and vans

- Limited availability of potable water supplies and wastewater disposal systems at the stalls; however, all street food markets visited had an acceptable common solid waste disposal system and a regular cleaning schedule

- In general, fish hawkers at street markets, when compared with public markets or supermarket chains, offered significantly less variety of fishery products per stall, but with the advantage of being comparatively less expensive. In most informal street markets visited, besides fish and fishery products, vegetables, fruits and other items such as noodles, dried fish, traditional food items, fresh chicken, pork and beef were also offered.

Retail sales of raw food, in particular fresh fruits, vegetables and fresh and cured fish at busy streets or around public markets by informal vendors in Kuala Lumpur are an integral part of the local market place. These market outlets are regulated and supervised by the municipal authorities.

The main factors for this growth of street food vending in Kuala Lumpur can be explained as follows:

i) Local eating habits, cultural significance of street food hawkers, socio-economic environment, unemployment rates, and urban population growth

ii) Loyal patronage of a growing clientele; street food vending has emerged in response to a socio-cultural need for inexpensive nutritious foods. In the particular case of fresh raw seafood, informal street markets operating from strategic locations at busy hours of the day save customers time and/or money which might otherwise be spent in search of public markets or supermarkets

iii) The Asian financial crisis had severely hit the urban poor population. Therefore, street food vending activities flourished.

Currently Kuala Lumpur City Hall is planning to regulate street food vending to include the designation of specific street areas as well as provision of support to vendors through the construction of adequate food stalls and related facilities. Joint plans with the Hawkers Association include the design of adequate vans for mobile food vending. Also a survey is being planned to collect updated information on the socio-economic characteristics of the street hawkers and petty traders.

In general, it was noticed during field surveys that fish and fishery products offered by street hawkers were of acceptable to good quality. It appeared that consumers felt satisfaction and convenience with readily available fresh fish at street seafood markets. Based on observations, it is concluded that street fish markets were well accepted by consumers and in general, provide personalised services with adequate seafood expertise. However, it is important to note that Asian consumers, in particular the Chinese, are less likely to complain when dissatisfied with a purchase due to cultural factors (face saving behaviour). Based on direct observation and limited survey data, it appears that convenience, strategic location and affordable prices directly influence repeat purchases of street vended fish, rather than customer satisfaction and loyalty.

At most street food markets visited, adequate to fair conditions were observed regarding fish handling practices. At most stalls, fresh seafood was displayed without ice, except some high value finfish, shrimp, prawn and squids which were kept with crushed ice. However, most street fish vendors had at least one insulated box to keep chilled fish in crushed ice and one (1) 15 – 20 litres capacity plastic bucket for storage of potable water for fish cleaning. Some large stalls had at least one lined insulated HDPE container to keep fish with ice. Regarding the variety of fish and fishery products at street markets, most stalls had about ten (10) fresh/chilled fish species or six (6) fishery products (mainly minced, cured and fermented) on display. The hawkers indicated that they were holding inventories of fresh fish from one to two working days. On average, street fish vendors operate about 6 to 8 hours daily and most of the vendors interviewed indicated that the average number of working days is about 7 days per week. The average daily sales per stall are about 45 – 60 kg of fresh fish and shellfish.

Our limited street fish retailer's survey indicated that men are the predominant operators of the street seafood retail stalls in Kuala Lumpur. A limited gender analysis showed that most women and men run street vending as a family business.

The main challenge is therefore the need to implement effective and sustainable interventions, taking into account the peculiar characteristics of street fish vending in Kuala Lumpur. Statutory requirements, including licensing, should be linked to equipment/ infrastructure development programmes. In particular, seafood street vending should have adequate provision of improved facilities for handling, chilled storage and preparation which can be provided by targeting busy street areas where seafood vendors regularly operate. In addition, different seafood vendors, depending on the type of seafood prepared and sold (e.g. chilled raw fish and cooked fish/squid balls), working hours, working places, *modus* *operandi* (with fixed stalls or itinerant vendors with pushcarts), have varied requirements in terms of equipment and facilities, as well as different views regarding proposed improvements of their services and facilities.

The use of simple dial metallic thermometers is suggested, to regularly measure temperature of seafood on display at street fish markets. Dial thermometers can easily be calibrated to a known temperature by adjusting a hex nut located under the dial. These thermometers were locally available. This basic tool could be included as part of the training kit for street fish vendors. In addition, adequate supplies of potable water (water taps) as well as suitable wastewater drainage systems should be made available to each street fish stall. Water is used extensively in fish markets not only for fish cleaning, but also to flush offal and blood from equipment and floors, and to flume wastewater to floor drains and collection sumps. The first step for the implementation of potable water supplies in individual stalls at street fish markets should be to analyse water use patterns, install water meters and regularly record water consumption. The next step should be to undertake a survey of all market area and ancillary operations to identify wasteful practices and undertake corrective actions. Each street fish vendor should pay according to their water consumption and proportionally for the provision of wastewater drainage systems.

Regular training courses on fresh/chilled fish handling and hygiene should be part of any development programme for street seafood vendors organised by the Kuala Lumpur City Hall in co-ordination with the relevant government agencies. This training should be aimed at providing adequate guidance and technical assistance to fish hawkers on proper seafood handling and personal hygiene practices. All stall holders and their assistants who are involved in the preparation and sale of seafood should be required to attend and pass this training course.

Basic technical fields, which may be relevant for training courses intended for street fresh fish vendors, are as follows:

i) Introduction to the concepts of freshness, quality, wholesomeness and nutritive value

ii) The care of live and fresh fish, handling methods, use of ice, receiving deliveries, quality inspection, storage of live and chilled fish; hygiene and sanitation for fish retailers, selection and application of detergents and disinfectants

iii) Quality and quality aspects at retail level; display of fish; promotion of fish sales techniques. Avoiding bad marketing practices

iv) National and municipal regulations and codes of practice for fish vending

v) Introduction to business planning; simple economics for fish retailing

vi) Equipment & facilities development programmes in street fish vending.

3.4.1 Typical Street Food Markets in Kuala Lumpur

Municipal authorities license hawkers operating in most street food markets in Kuala Lumpur. In general, hawkers have to pay a monthly stall space fee and an annual license fee. Typical of many urban street markets is their location (usually near public markets) and the use of umbrellas and/or canvas awning which provide shelter and protection from rain and sun.

Seafood stalls are mostly equipped with trestle tables (the table top made of galvanised iron, stainless steel or fibreglass) for display of produce, insulated HDPE containers, chopping boards, weighing scales and price boards. They usually operate 6 – 7 days per week, according to the municipal regulations. The daily cleaning operations and solid waste collection at this street food market is carried out by a specialised private agency under contract with the local authorities. In most street raw food market outlets surveyed, the following food items were offered:

i) Fresh seafood

ii) Minced fish (raw)

iii) Cured fish (dried and dried-salted fish)

iv) Fermented fish sauce, pickled shrimp/prawn and shrimp/prawn paste

v) Squid/fish balls

vi) Noodles and rice/bean curd

vii) Dressed chicken/eggs

viii) Fresh goat meat, pork and beef, live frogs

ix) Fresh fruits and vegetables

x) Ready-to-eat food and beverages

xi) Roasted pork/duck

xii) Charcoal/dry goods/lentils/dried vegetables

xiii) Cooked food (various)

xiv) Sweets/cakes

xv) Traditional medicines

xvi) Shoes/newspapers/plastic articles/clothes

xvii) Jade articles/kitchen utensils/joss sticks

xviii) Garden utensils/seeds/fertiliser

Figure 35 illustrates the general layout of a typical street food market outlet located in the Pudu area. The total number of hawker stalls operating in the streets surrounding the Pudu retail market was about 1,097, of which 162 stalls were selling fresh seafood (including some also offering fermented and cured fishery products). In addition, 28 hawker stalls were offering fish balls/minced fish and/or bean curd.

The seafood stalls were distributed in the five areas allocated in the streets surrounding the Pudu market, without a specific pattern. However, the main concentration of seafood stalls was located in the areas A, B and C.

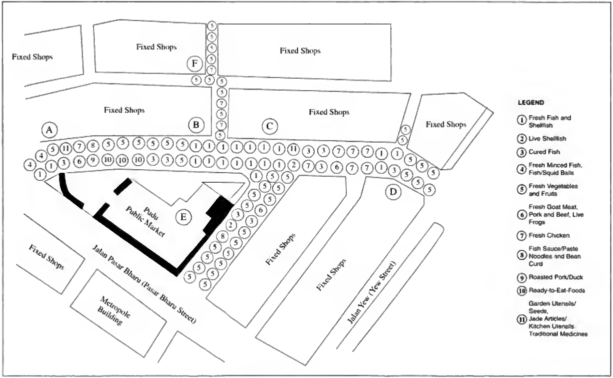
The market hours for street food hawker stalls were from 0600 hours to 1210 hours, immediately after the cleaning operations and solid waste collection were carried out. Some of the stall equipment was kept in nearby areas and the streets used by hawkers were cleared by afternoon. The typical sales or table area per seafood retailer would be in the range of 1.9 to 3 m^2. In addition, some space was taken up for insulated boxes that could not fit below the display table and the chopping board. A typical area for a seafood stall would be in the range of 3 to 4 m^2. Table 16 shows the total distribution of licensed stallholders (including street hawkers) in Pudu market, by ethnicity.

Table 16: Distribution of Licensed Stall Holders in Pudu Market, by Ethnicity (including Street Hawkers)

Ethnic Group	Number of Stall Holders (Percentage)
Chinese	1,316 (81.4 %)
Malay	237 (14.6 %)
Indian	64 (4 %)
Total	**1,617 (100 %)**

Source: Kuala Lumpur City Hall

Figure 35: Layout of a Typical Street Food Market in Kuala Lumpur (Pudu Market Area)


Fixed Shops
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Fixed Shops
A
B
C
D
E
F
Pudu Public Market
Jalan Pasar Bharu (Pasar Bharu Street)
Jalan Yew (Yew Street)
Metropole Building
LEGEND
① Fresh Fish and Shellfish
② Live Shellfish
③ Cured Fish
④ Fresh Minced Fish, Fish/Squid Balls
⑤ Fresh Vegetables and Fruits
⑥ Fresh Goat Meat, Pork and Beef, Live Frogs
⑦ Fresh Chicken
⑧ Fish Sauce/Paste Noodles and Bean Curd
⑨ Roasted Pork/Duck
⑩ Ready-to-Eat-Foods
⑪ Garden Utensils/ Seeds, Jade Articles/ Kitchen Utensils, Traditional Medicines

Table 17 shows details of technical features and estimated costs of basic equipment of a typical street fish hawker in Pudu market.

Table 17: Technical Features and Estimated Costs of Basic Equipment used by a Typical Street Fish Hawker in Pudu Market

Description of Item	Quantity	Unit Cost (M. Ringgit)
Display tabletop (stainless steel); (Dimensions: 120 cm x 164 cm x 6 cm)	1	500
Set of folding trestles (wood)	1	80
Insulated container (expanded polystyrene, 50 mm thick) 50 kg capacity	4	15
Insulated container (HDPE walls and polyurethane foam) 100 kg capacity	1	250
Umbrella (waxed canvas)	1	120
Stand pole for the umbrella	1	50
Plastic trays	12	2
Chopping board (hardwood)	1	65
Filleting knives	1	40
Plastic container (for carrying water); 5 gallons capacity	2	8
Price board	1	10
Plastic bin (offal collection)	1	6
Plastic bucket	1	6
Weighing scale (10 kg capacity); platform type	1	75
Portable calculator	1	20
Total Cost of Basic Equipment		**1,322**

Source: field surveys conducted by the author and counterparts

3.5 Improved Equipment for Street Seafood Vending

3.5.1 "Fish on Wheels" Marketing Scheme

A successful seafood marketing scheme known as "Fish on Wheels", based on motorised retail vans and sponsored by the Fisheries Development Authority of Malaysia (LKIM), was initiated in 1997. This marketing scheme was implemented in the Kuala Lumpur area, in co-ordination with other local agencies/institutions, catering to mostly Government employees. A sales officer and driver operate these motorised mobile facilities. Figure 36 illustrates a typical "Fish on Wheels" van for retail sales of fish.

The concept of this scheme is based on the following criteria:

a) All purchasing is done in bulk at a wholesale market

b) An adequate market mix can be offered, including appropriate prices, adequate quality products and good product variety (fresh seafood, frozen fish/squid balls, dried fish, and vegetables and poultry products)

c) Retailing through mobile fresh seafood outlets reduces fixed overhead costs, which is a clear advantage in comparison to conventional fish shops and supermarkets

d) The concept capitalises on the increasing demand for fresh/chilled seafood of consistently high quality. Fish is a staple food for the local population

e) The "Fish on Wheels" concept is an innovative marketing scheme which can allow a relatively large volume of sales, as well as consistent standard of operation and product quality

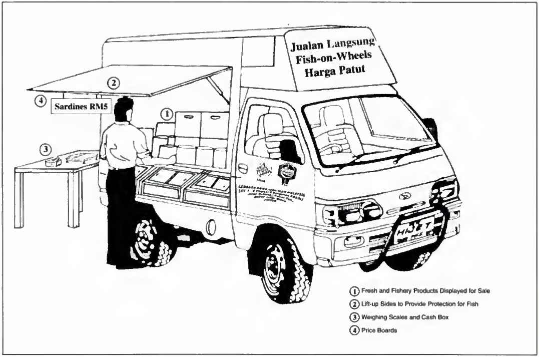
f) The high level of mobility permits an extensive area of the city and increased number of government agencies to be reached.

However, such motorised retail vans involve comparatively high capital investment and operating costs, which requires careful planning and adequate marketing strategies. Features of the "Fish on Wheels" scheme are as follows:

a) It comprises a small fleet of four (4) motorised retail vans. Each van is supplied solely from the company's depot (located in Kuala Lumpur) on a daily basis. The central depot also provides facilities including crushed ice supply, engine services and maintenance as well as services for the placing of individual orders for the following day

b) The retail van has a special purpose-built body, which incorporates a full width platform made in stainless steel, lift-up sides to provide additional protection to seafood and a multiple compartment for storing and displaying other food items such as vegetables, poultry, condiments and dried fish/shrimp. Insulated fish boxes, HDPE fish boxes,

Figure 36: Van used in "Fish on Wheels" Marketing Scheme


Jualan Langsung
Fish-on-Wheels
Harga Patut
②
④
Sardines RM5
①
③
① Fresh and Fishery Products Displayed for Sale
② Lift-up Sides to Provide Protection for Fish
③ Weighing Scales and Cash Box
④ Price Boards

chopping boards and weighing scales are placed on the stainless steel platform. On the lift-up side an attractive price board is placed at the start of sales operations. The vehicle is a standard one (1) tonne van with a 4 – cylinder SOHC engine, 1,400 cc and 78hp/ 5,500 rpm. The retail price of the van is about RM 30,700 (US$ 8,079) including basic insurance. The total cost of the truck body and display unit is about RM 8,000 (US$ 2,105).

Table 18 shows details of the technical features and estimated costs of basic equipment used by a "Fish on Wheels" unit, based on data provided by LKIM.

Table 18: Technical Features and Estimated Costs of Basic Equipment of "Fish on Wheels"

Description of Item	Quantity	Unit Cost (RM)
Retail van (including special purpose-built body)	1	38,700
Insulated container (HDPE walls and polyurethane foam) 50 kg capacity	1	150
HDPE fish boxes (25-kg capacity)	16	20
HDPE trays (15 kg capacity)	20	5
Chopping board (hardwood)	1	45
Filleting knives	1	40
HDPE baskets	5	6
Price board	1	10
Portable table (HDPE top)	2	35
Weighing scale (30 kg capacity); platform type, digital	1	1,000
Portable calculator	1	35
Total Cost of Basic Equipment		**40,500**

c) A central buying point (Selayang wholesale market) ensures the best possible availability and price of seafood. However, during the survey period there were some problems with regular supplies of seafood; management personnel indicated that in the previous months, about 60% of the fresh fish was imported from Thailand due to shortage of fish supplies from local landings.

d) A good variety of seafood is offered regularly (about 10 – 15 species). On average, each retail van sells about 450 – 500 kg of fresh fish daily and serves three (3) Government agencies. There are well-established sales periods in each location namely: a) 09:00 to 11:00 hours; b) 12:30 to 14:30 hours; c) 14:30 to 16:30 hours; operating from Mondays to Saturdays (6 days/week).

e) Adequate supervision and motivation of the retail van operators is carried out to improve productivity and services to consumers. The general profile of consumers served by retail vans could be described as mostly housewives from socio-economic levels B, C and D. They usually purchase food items on a regular basis and to a lesser extent, on impulse. They buy because of assured regular supplies, convenience for them, competitive prices and consistently good quality.

f) Average daily sales were as follows:

Type of Product	Average Daily Sales (kg)
Fresh/chilled seafood	450 – 500
Frozen fish/squid balls	25
Dried shrimp	2.5
Dried anchovy/ cured squid	2.5
Poultry, beef and vegetable	200

Table 19 shows the retail prices of seafood and meats offered through the "Fish on Wheels" marketing scheme in Kuala Lumpur at the time of the survey.

Table 19: Retail Prices of Seafood and Meats Offered by "Fish on Wheels" Vans in Kuala Lumpur

Products	Retail Prices (RM/kg)
Seafood:	
Silver Pomfret	17.0
Black Pomfret	15.0
Spanish Mackerel	14.0
Threadfin	16.0
Wolf-herring	12.0
Mangrove Snapper	15.0
Seabass	17.0
Sand Velvet Shrimp	25.0
Giant Freshwater Prawn	20.0
Mangrove Crab	13.0
Loligo Squid	10.0
Red Snapper	13.0
Threadfin Bream	7.5
Yellow Striped Trevally	6.0
Hardtail Scad	5.0
Indian Mackerel	7.5
Dried Anchovy	15.0
Dried Shrimp	30.0
Meat &Poultry:	
Beef Cutlets	8.0
Dressed Chicken	5.0

Source: Data collected during field surveys conducted by the author and counterparts

Table 20 shows the estimated operational costs of a standard "Fish on Wheels" unit in Kuala Lumpur.

Table 20: Estimated Operational Costs of a "Fish on Wheels" Unit

Cost Item	Daily Expenses (RM)	Days worked per month	Monthly Amount
I) Fixed Costs	68.75	24	2,062.50 (4.50%)
Depreciation of major equipment:	30.00		900.00
Transport van			
Chest freezer			
Weighing scales & fish boxes			
Maintenance of equipment:	6.25		187.50
Transport van			
Chest freezer			
Weighing scales			
Labour costs:	5.00		150.00
Driver			
Assistant			
Transportation costs of fish/fishery products from wholesale market/dealer	10.00		300.00
Miscellaneous expenses:	17.50		525.00
Road taxes			
Insurance			
Rental of premises			
II) Variable Costs	1,425.25	24	43,305.90 (95.45%)
Purchase of fish and fishery products	1,375.00		41,250.00
Ice supplies (4 blocks of ice/day; 70 kg/block)	41.60		998.40
Packaging materials:			
Plastic bags	5.75		172.50
Losses of fishery products	25.00		750.00
Other costs:	4.50		135.00
Water			
Parking charges			
Electricity			
III) Total Operational Costs	1,494.00	24	45,368.40 (100%)

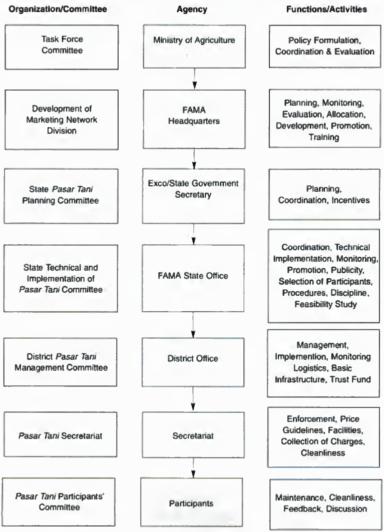
Source: Fisheries Development Authority of Malaysia (LKIM)

3.5.2 "Pasar Tani" (Farmers' Market) Scheme

An interesting marketing scheme known as *Pasar Tani* has as its main objectives to encourage farmers' and fishermen's organisations to participate directly in the marketing of their produce, enabling them to obtain higher prices, expand the market size for agricultural and fisheries produce and provide consumers with a wider choice of foodstuff at reasonable prices.

This marketing scheme is co-ordinated and organised by the Federal Agricultural Marketing Authority (FAMA). Figure 37 shows the organisational chart of the *Pasar Tani* marketing scheme.

Figure 37: "Pasar Tani" Organizational Chart



Organization/Committee	Agency	Functions/Activities
Task Force Committee	Ministry of Agriculture	Policy Formulation, Coordination & Evaluation
Development of Marketing Network Division	FAMA Headquarters	Planning, Monitoring, Evaluation, Allocation, Development, Promotion, Training
State *Pasar Tani* Planning Committee	Exco/State Government Secretary	Planning, Coordination, Incentives
State Technical and Implementation of *Pasar Tani* Committee	FAMA State Office	Coordination, Technical Implementation, Monitoring, Promotion, Publicity, Selection of Participants, Procedures, Discipline, Feasibility Study
District *Pasar Tani* Management Committee	District Office	Management, Implemention, Monitoring Logistics, Basic Infrastructure, Trust Fund
Pasar Tani Secretariat	Secretariat	Enforcement, Price Guidelines, Facilities, Collection of Charges, Cleanliness
Pasar Tani Participants' Committee	Participants	Maintenance, Cleanliness, Feedback, Discussion

The main characteristics of the *Pasar Tani* scheme are as follows:

i) This marketing scheme operates usually once a week in selected areas of the city. The retailers can operate in several locations provided that they can assure reasonably regular supply of produce. A selection of strategic locations is done by FAMA in co-ordination with local authorities

ii) At each *Pasar Tani*, a good variety of fresh vegetables, fruits, seafood, chicken, red meat, dairy products, flowers, traditional medicine and handicrafts is regularly offered.

iii) FAMA provides the following services:
   - Rental of facilities such as umbrellas, tables and baskets
   - Market price information
   - Promotional campaigns to attract consumers
   - Training to upgrade retailers' skills in trading activities
   - Supervisory services to manage retailers' requirements, to protect consumers rights and ensure adequate levels of cleanliness
   - Conduct feasibility studies on the viability of the business before setting up a new *Pasar Tani*.

iv) A total of 28 *Pasar Tani* outlets were set up in Kuala Lumpur, with 2 outlets operating every day of the week, 9 on Sundays, 8 on Saturdays, 5 on Thursdays, 3 on Wednesdays and 1 on Fridays. Market hours vary, most operating from 07:00 hours to 13:00 hours and 14:00 hours to 20:00 hours. Retailers are charged a monthly fee (by FAMA) for stall space allocation and an annual license fee (by municipal authorities).

v) Most seafood retailers operate from vans; fish is displayed on trestle tables with an umbrella to provide protection from rain and sun. They usually carry fish with crushed ice in insulated boxes. This type of stall has the advantage that it can be easily assembled, and after market hours, it can be loaded onto the vans and moved to another market location. The typical sales or table area per retailer would be in the range of 1.7 to 3.4 m^2. The most common material used to manufacture the display tabletops is fibreglass. In most locations visited, retailers displayed their fish on a standard fibreglass tabletop (91.44 cm wide and 182.9 cm long) with folding trestles provided by FAMA. They were equipped with cutting boards, weighing scales, plastic boxes and wash basins for washing fish and cleaning the stall area. After market hours all equipment was washed with clean water, wastes were collected in plastic bags and placed in offal bins and the stall area was rinsed with clean water. The services of the cleaning personnel are included in the monthly stall space fee.

vi) Seafood supplies in most *Pasar Tani* visited were from Fishermen's Associations. All retailers interviewed indicated that they were not fishermen, but were linked to these Associations; therefore the concept of direct marketing from producers to consumers was somehow met. They also indicated that the frequency of purchases of fresh seafood was 3 – 4 days/week. Average daily sales were about 120 kg of fresh fish. In most cases, the driver was the owner of the business and was in charge of all trading operations. Table 21a shows the technical features and estimated costs of the basic equipment used by a typical *Pasar Tani* fishmonger operating in Kuala Lumpur.

Table 21a: Technical Features and Estimated Costs of Basic Equipment used by *Pasar Tani* Fishmongers

Description of Item	Quantity	Unit Cost (RM)
Van (1.8 tonne) wooden body; secondhand	1	21,000
Insulated container (HDPE walls and polyurethane foam) 50 kg capacity	5	150
Insulated container (HDPE walls and polyurethane foam) 100 kg capacity	1	250
Display tabletop (fibreglass); (Dimensions: 92 cm x 182 cm x 7 cm)	2	170
Set of folding trestles (wood)	2	78
Umbrella	2	120
Plastic trays	12	1.5
Chopping board (hardwood)	1	65
Filleting knives	1	40
Plastic container (for carrying water); 5 gallons capacity	2	8
Price board	1	10
Plastic bin (offal collection)	1	6
Plastic bucket	1	6
Weighing scale (10 kg capacity); platform type	1	70
Portable calculator	1	20
Total Cost of Basic Equipment		**22,987**

Source: Field surveys conducted by the author and counterparts

Table 21b shows the estimated operational costs incurred by a typical *Pasar Tani* fishmonger operating in Kuala Lumpur.

Table 21b: Estimated Operational Costs incurred by a *Pasar Tani* Fishmonger (Kuala Lumpur)

Cost Item	Daily Expenses (RM)	Days worked per month	Monthly Amount
I) Fixed Costs	**156.90**	**12**	**1,882.80** **(22.84%)**
Depreciation of major equipment: Transport van Weighing scales & fish boxes Display tables Insulated containers	16.90		202.80
Maintenance of equipment: Transport van Weighing scales Folding trestles	15.00		180.00
Labour costs (including meals): Driver Assistant	90.00	12	1,080.00
Transportation costs of fish/fishery products from landing places	20.00	12	240.00
Miscellaneous expenses: Road taxes Insurance Rental of premises	15.00	12	180.00
II) Variable Costs	**529.80**	**12**	**6,357.60** **(77.15%)**
Purchase of fish and fishery products	480.00		5,760.00
Ice supplies (2 blocks of ice/day; 70 kg/block)	20.80		249.60
Packaging materials: Plastic bags	10.00		120.00
Losses of fishery products	15.00		180.00
Other costs: Water Parking charges	4.00		48.00
III) Total Operational Costs	**686.70**	**12**	**8,240.40** **(100%)**

Source: Field surveys conducted by the author and counterparts

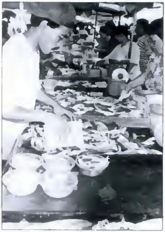


Figure 38. Fresh fish displayed at a street fish retailing stall. Pudu Market area, Kuala Lumpur.

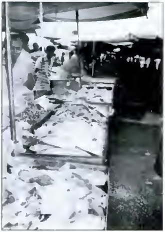


Figure 39. Side view of a typical street fish-retailing stall at a busy street food market. Kuala Lumpur.

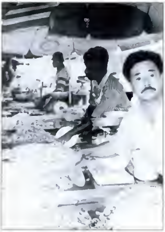


Figure 40. Fresh shrimp displayed at a street fish retailing stall. Pudu market area, Kuala Lumpur.

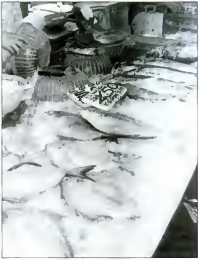


Figure 41. Well-iced fish displayed at a street food market. Kuala Lumpur.

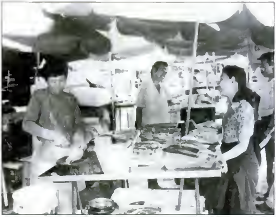


Figure 42. Typical small-size fresh fish retail stall at a busy street food market. Kuala Lumpur.

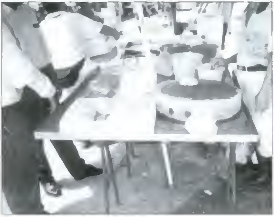


Figure 43. Side view of a typical fresh minced fish retail stall at a street food market. Kuala Lumpur.

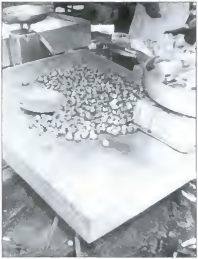


Figure 44. Live shellfish displayed at a street food market outlet. Kuala Lumpur.

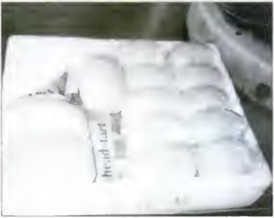


Figure 45. Display of fresh minced fish packed in plastic bags at a street food market. Kuala Lumpur.

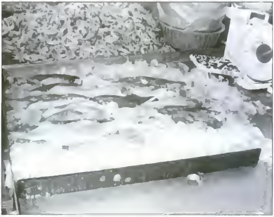


Figure 46. Well-iced squid displayed at street food market. Kuala Lumpur.

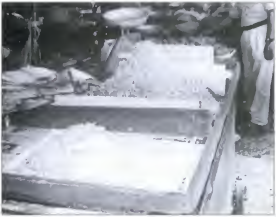


Figure 47. Display of dried anchovies in a pushcart at a street food market. Kuala Lumpur.

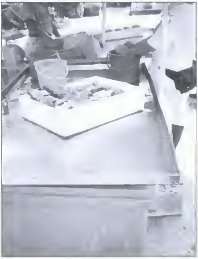


Figure 48. Typical stainless steel display top used in street fish retail stalls. Kuala Lumpur.

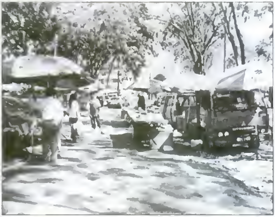


Figure 49. Overall view of stalls at a *Pasar Tani* street food market. Kuala Lumpur.

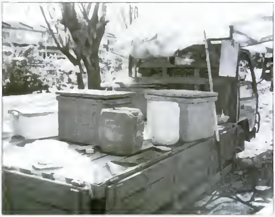


Figure 50. Basic fish retailing equipment used by *Pasar Tani* stallholders. Kuala Lumpur.

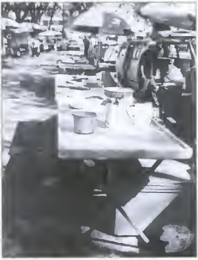


Figure 51. Side view of a typical fish retail stall at a *Pasar Tani* street food market. Kuala Lumpur.

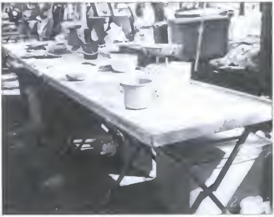


Figure 52. Side view of a fibreglass display top and foldable trestle table frame at a *Pasar Tani* street market. Kuala Lumpur.

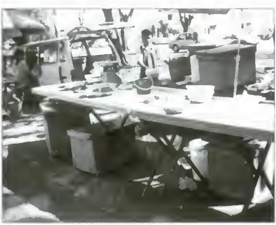


Figure 53. Disassembling and loading fish retailing equipment onto vans during closing hours. *Pasar Tani* street market, Kuala Lumpur.

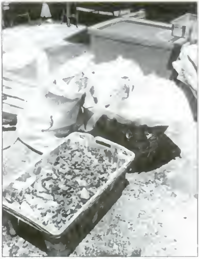


Figure 54. Solid fish waste collection at a *Pasar Tani* street market, Kuala Lumpur.

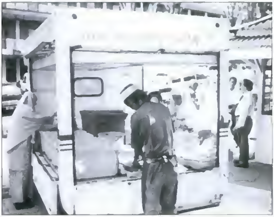


Figure 55. Fish filleting operations in a "Fish on Wheels" van, Kuala Lumpur.

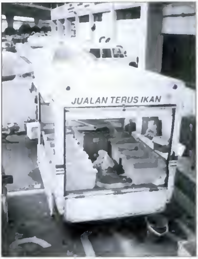


Figure 56. Overall view of an operational "Fish on Wheels" van, Kuala Lumpur.

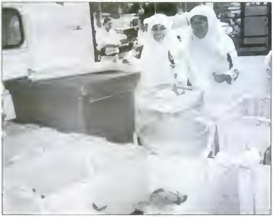


Figure 57. Display of boxed fresh fish in a "Fish on Wheels" van. Kuala Lumpur.

Figure 58. Fresh fish selection in a "Fish on Wheels" van. Kuala Lumpur.

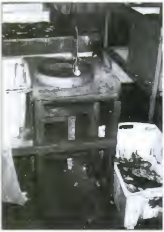


Figure 59. Side view of a typical live fish retail stall at a public market. Kuala Lumpur.

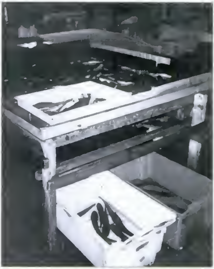


Figure 60. Display of live catfish and snakehead at a fish retail stall. Kuala Lumpur.

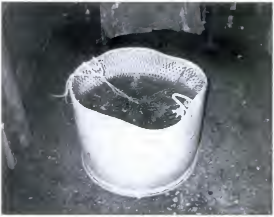


Figure 61. Typical low-cost live fish transport container (plastic body with nylon mesh) used in wholesale and retail operations. Kuala Lumpur.

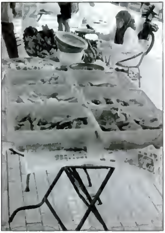


Figure 62. Display of traditional deep-fried minced fish products on a folding trestle table, at a temporary fish retail stall. Ipoh, Malaysia.

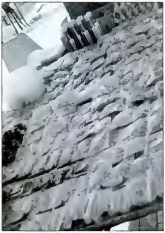


Figure 63. Typical display of pre-packed dried-salted and dried fish, dried shrimp and fermented fish products on a folding trestle table, at a temporary fish retail stall. Ipoh, Malaysia.

4. CASE STUDY: SINGAPORE

4.1 Introduction

Singapore supports a substantial market for live, fresh, frozen and cured fish and fishery products. Current annual seafood trade data indicate that about S$ 1.2 billion (US$ 696,864,111) was traded in Singapore during 1998 – 1999. Singapore, due to its strategic location in Southeast Asia, adequate transportation facilities (by sea, air and land) overall economic growth and significant increases in disposable income of the population, has become an important seafood business centre and main distribution hub in the region. It serves as an export market for fish and fishery products from Southeast Asian countries as well as a transhipment base for fishery products from around the world. Singapore has become one of the wealthiest countries in Asia, with an average per capita GDP of US$ 22,205 in 1998; only Japan and Hong Kong had higher per capita GDP among the Asian countries. However, Singapore's total fish and shellfish catches are relatively small; in 1997, FAO reported a catch volume of 9,250 metric tonnes. Re-exports of seafood from Singapore are increasing; in 1999, re-export figures were estimated at 75,000 metric tonnes. Official figures for 1998 showed that about 56 percent of imported shrimp and prawns is re-exported to Japan, Hong Kong, the Netherlands and Malaysia, and 91 percent of imported high quality tuna is re-exported to Japan (64 percent), Italy (12 percent) and Thailand (10 percent). In addition, 57 percent of imported marine fish is re-exported to Malaysia (39 percent), Taiwan (22 percent) and China (20 percent). Re-exports of fish and fishery products from Singapore to ASEAN[1] countries are mainly valued-added or high value fishery products, due to the fact that most of those countries are able to supply fish for their domestic markets as well as for exports markets. Table 22 shows Singapore's imports and exports of fish and fishery products during 1997.

Table 22: Imports and Exports of Fish and Fishery Products (1997)

Fishery Product	Imports (MT)	Exports (MT)
Fish, fresh, chilled or frozen	111,664	83,182
Fish, dried, salted or smoked	3,807	1,389
Crusteceans and molluscs	45,994	22,308
Fish, canned	18,035	2,008
Crustaceans and molluscs, canned	5,039	2,728

Source: FAO Yearbook of Fishery Statistics-Commodities, 1997

Singapore imports more than 90 percent of its fish for domestic consumption; in 1997, FAO fisheries statistics reported an apparent annual per capita fish supply of about 31.2 kg. Table 23 shows the breakdown of food per capita consumption in 1998. It is estimated that in the year 2000, the total population will reach about 4.1 million[2] with an average density of 6,406 people/km^2.

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[1] Association of Southeast Asian Nations (ASEAN),with the following member countries: Brunei Darussalam, Cambodia, Indonesia, Laos, Malaysia, Myanmar, the Philippines, Singapore, Vietnam and Thailand.

[2] Based on the international database of the US Census Bureau, International Programs Center, 2000 (http://www.census.gov).

Table 23: Food Per Capita Consumption (1998)

Food Item	Annual Per Capita Consumption (kg/year)
Chicken	32
Fish	26
Pork	23
Beef	3
Duck	3
Mutton	3
Vegetables	77
Fruits	82

Source: The Straits Times (Singapore), 8th March, 2000

4.2 Fish Distribution Channels

The domestic seafood market for fishery products is distinguished principally by the heavy dependence on imports by air from countries such as China, Malaysia, India, Sri Lanka; by sea from Indonesia and by land mainly from Thailand and Malaysia. Both captured and cultured fish and fishery products are regularly traded in the domestic seafood market. Chilled and live seafood is landed at the two main fishing ports, namely the Jurong and Senoko fishing ports and wholesale markets. Jurong and Senoko wholesale markets handle about 100,000 and 20,000 metric tonnes of fish annually, respectively. Jurong is the biggest, with a market floor area of 9,000 m^2 and 110 market lots (allotted area on which the agents display and trade seafood). Senoko has a market floor area which currently houses about 36 market lots for trading operations with each agent having an allotted area of 40 m^2 for displaying and selling fish. Fish in both wholesale markets is sold mainly by agreement on price with the buyers, and to a lesser extent through auction by agents, who sell to retailers, institutional buyers, processors and seafood traders. Average daily volumes of seafood traded in the Jurong and Senoko wholesale fish markets are estimated to be about 250 and 45 metric tonnes respectively. The fishing ports and wholesale markets are managed by the Primary Production Department (PPD). Both wholesale markets operate regularly from about 02:00 hours to 07:00 hours. However, some of the fish landed in Singapore does not go through the auction halls, but are supplied directly to restaurants, hotels and supermarkets; and some chilled fish (particularly tuna and some high value species) is selected and packed for re-export to neighbouring countries.

There is also a significant live fish and shellfish trade, some of which does not go through the auction, but are handled by private wholesalers located at Changi ferry terminal. These wholesalers operate small live fish carriers/vivier boats (with tanks and aeration systems), collecting live marine finfish produced by cage culture farms, air-flown live fish and shellfish, and live fish brought in by fishing vessels operating in Singaporean waters. Indonesian fishing vessels also bring in some live marine fish through Jurong fishing port.

High value live finfish and shellfish is transported by importers/traders in carrier trucks equipped with tanks and aeration systems for local distribution to restaurants, hotels, public markets and some supermarkets. A proportion of the live fish is also exported to Hong Kong and China.

The supply of chilled fish from the East Coast of Malaysia is seasonal, with a peak period from March to June and a low supply period during November to February. However, the main influences on market prices and demand for high value chilled fish are the Chinese New Year, the wedding season (August to October) and the country's economy. During the Chinese New Year, rabbitfish *(Siganus canaliculatus)* command high prices (among the ethnic Chinese population, rabbitfish is associated with good luck). Ripe females fetch premium prices, and are traditional holiday delicacies. However, during the rest of the year, rabbitfish has little to moderate demand in the market. During the wedding season, the consumption and demand for high-priced fish and shellfish (shrimp, mud crab and lobster), mainly through restaurants, is very high.

Another important factor that influences prices and demand of high value fish is the level of growth or recession affecting the country's economy. For example, during 1995 to 1998, the domestic market for live marine finfish was price-sensitive (affected by the economic crisis in the region, the number of tourist arrivals, as well as restaurant sales significantly declined) and as a result, imports of live marine fish (mainly seabass, snapper, and grouper) declined by about 35%. The lowered purchasing power of consumers and reduced frequency of dining-out and family celebrations forced the market for live marine fish to look for alternative and cheaper products (such as seabass) or reduce imports significantly. The market for live marine finfish is relatively small in terms of volume and it is estimated that about 1,200 to 1,850 tons were traded annually during the period 1995 to 1998, with an average C&F price[3] of S$ 5.35/kg (US$ 3.097/kg) in 1998. FAO statistics for 1997 reported that Singapore imported a total of 2,954 tonnes of live fish (marine and freshwater). The main suppliers of live marine finfish are Malaysia, and to a lesser extent, Indonesia. Live Indo-Pacific swamp crab or mangrove crab *(Scylla serrata)* has a good demand in Singapore and it is mainly marketed alive. The main suppliers of live mud crab are Sri Lanka, India, the Philippines and Bangladesh. The market size for mangrove crab in Singapore is about 3,300 metric tonnes/year including supplies of chilled crabs (Singapore Trade Statistics do not differentiate product forms for crab). The average C&F price for live mangrove crab in 1999 was about US$ 4 to 5 per kg, but ripe females fetched about US 7 – 8 per kg. During February 2000, the average wholesale prices for live groupers were about S$ 15 to 20 per kg and S$ 8 – 11 per kg for live snappers. Table 24 shows the average wholesale prices of fresh fish at Jurong and Senoko during 1999.

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[3] In February 2000, the rate of exchange was US$ 1.00 equal to 1.722 Singapore dollars.

Table 24: Average Wholesale Prices of Fresh Fish at Singapore's Wholesale Markets during 1999

Species	Jurong		Senoko	
	Low Price (S $/kg)	High Price (S $/kg)	Low Price (S$/kg)	High Price (S $/kg)
Red snapper (*Lutjanus sp.*)	3.13	4.29	4.31	5.73
Chinese pomfret (*Pampus chinensis*)	17.67	24.90	17.70	25.91
White/silver pomfret (*Pampus argenteus*)	11.71	14.61	10.39	14.14
Indian mackerel (*Rastrelliger kanagurta*)	3.21	4.42	3.05	4.04
Spanish mackerel (*Scomberomorus sp.*)	4.76	6.67	5.09	6.54
Threadfin (*Polynemus indicus*)	9.80	15.31	10.74	13.29
Yellow-banded scad (*Selaroides leptolepis*)	1.39	3.82	2.61	3.68

Source: Dr. Tan Sen Min, MFRD/SEAFDEC, Singapore.

There is also an important speciality dried fish market for products such as dried anchovies, salted mackerel, sharkfin, fishmaw, sea cucumber, abalone, shrimp, squid, cuttlefish and oyster. The domestic dried fish production is negligible and the country is a net importer of these products. Major suppliers of dried fish to Singapore are Thailand, Malaysia, South Korea, Vietnam, Taiwan and Hong Kong. A portion of the high quality dried fish is re-exported to Hong Kong and China as Singapore's strategic location has made it an important distribution centre of dried fish for Southeast Asia. Table 25 shows the average wholesale prices of dried fishery products in Singapore during February 2000.

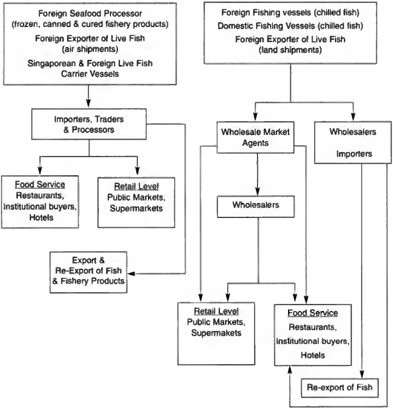
Table 25: Average Wholesale Prices of Dried Fishery Products (February, 2000)

Dried Fish Product	Wholessle Price (S $/kg)
Anchovies	
Whole (average quality)	5 – 6
Split open	10
Fillets	9 – 11
Scallops	150
Sea cucumber	
Black lollyfish	23 – 28
Tigerfish	9 – 13
Dried squid (butterfly cut) (6 – 7 pieces/kg)	26 – 28
Sharkfins	
Tiger shark, tails (20 cm/up)	33 – 34
Sharkfin rays (below 10 cm)	64 – 66
Fishmaws	
Jewfish, grade B	
Below 15 pieces/kg	55 – 57
Above 15 pieces/kg	19 – 25

Source: Data obtained during field market surveys by the author and counterparts

Seafood reaches consumers in Singapore through a multi-level system, which may involve at least two transactions before the fish or fishery product is purchased in a public fish market or supermarket or eaten in a restaurant/food stall. The channels of distribution incorporate locally caught and processed seafood, with live, chilled and frozen imported items from the region and around the world; these items can be re-packed or processed locally and re-exported. The seafood distribution chain is typically very short, in particular for live seafood, with importers acting as distributors and agents directly dealing with retailers and restaurants. Supermarket chains are often direct importers of frozen and canned seafood product. At the two wholesale fish markets, the distribution chain is short, with wholesale agents selling fish to wholesalers, who distribute the products to retailers and institutional buyers. Some wholesalers act as purchasing agents for restaurants, catering organisations, supermarkets and large retailers. Singapore's main seafood (live, chilled and frozen products) distribution channels are illustrated in the simplified distribution chart presented in Figure 64.

Figure 64: Main Seafood Distribution Channels, Singapore



4.3 Singapore's Retail Fish Market

Singapore is home to a variety of retail establishments offering live, fresh, frozen, cured and canned seafood to consumers. The range of shopping options include public retail markets and licensed hawkers selling through stalls, which offer a wide selection of live fish, fresh fish and fishery products and cured fish. Public markets currently hold about 70% of the retail market share of chilled and live fish and fishery products. Large supermarket chains (such as NTUC Fair Price, Carrefour, Cold Storage, Shop N Save and Prime) and medium-sized independent supermarkets offer fresh, frozen, live, cured and canned seafood. Supermarkets are currently handling about 30 percent of the retail market share of chilled and live fish and fishery products. Despite the fact that most supermarkets are low-cost, low-margin, high volume, self-service operations, which are designed to provide the consumer's total needs for food and household-maintenance products, many still prefer to shop for seafood at public retail markets. The most popular product form is whole fresh fish and preferred species of finfish are: sea bream, Spanish mackerel, yellow-banded scad, red snapper, groupers, black, white & Chinese pomfret, threadfin and horse mackerel. In general, the retail price margin for chilled seafood products is about 25 percent.

There is a steady demand at supermarket level for chilled fillets, steaks and shellfish; consumers are willing to pay a little more for the convenience, dependability, quality and better packaging. Most supermarkets have well-defined seafood product strategies, including adequate product mix and variety. In most supermarkets, there is a full-service seafood section in charge of taking and preparing orders from consumers. The preparation may include weighing a specific quantity of fish or shellfish, gutting, cleaning or cutting a whole fish or fillet to the desired size or product form. Orders are then wrapped and labelled for the consumer. Alternatively seafood may be displayed "pre-packed", when a small number of units, such as 250/500 grams of fish fillets, steaks or shrimp are wrapped in clingfilm on a small tray, and pre-priced. If seafood is to be pre-packaged, it is done at source. Many of the larger supermarkets insist on a high standard of hygiene in the local seafood packhouses. It was also noticed that standards of construction, maintenance, quality control and hygiene were high, which increases the investment incurred by supermarkets. According to some supermarket chains, the true cost of these investments is considered when seafood-selling prices are calculated.

Convenient pre-packed shrimp (head-on, headless, peeled and ready-to-cook) offered in supermarket chains are high value products met with some demand; however, it appears that most shrimp consumption takes place through the catering sector. According to some supermarket personnel, consumers are aware of the difference between shrimp species, but may not know whether the shrimp were cultured or wild-caught. Some supermarket chains are also offering ready-to-eat fish for taking out and consumption at home. The sale of ready-to-eat fish is designed in a similar way to that of traditional Chinese roasted duck, which is very popular at supermarket chains. Table 26 shows the comparative retail prices of live and fresh fish in supermarkets and public markets during February 2000.

Table 26: Comparative Average Retail Prices of Live and Fresh Fish in Singapore (February, 2000)

Species/Type of Product	Price (S $/kg) Supermarkets	Price (S $/kg) Public Markets
Live Fish		
Tilapia (300 g/piece)	9.7	6.0
Grouper	25.8	25.0
Marble goby	28.8	n/a
Snakehead	n/a	10 – 12
Carp	n/a	6.5
Mangrove crab:		
Small size	–	10.0
Medium size	11.5	12.0
Large size	–	14.0
Spiny lobster	48.0	n/a
Giant tiger shrimp	24.9	23.0
Blue swimming crab	13.5 – 15.9	n/a
Crayfish	18.1	n/a
Whole Fresh Fish		
Threadfin bream	4.9	4.7
White pomfret	10.0	10.5
Chinese pomfret	16.9	16.5
Rabbitfish	6.6	6.0
Black pomfret	6.5	6.8
Red grouper	9.5	9.0
Red snapper	14.8	15.0
Spanish mackerel	8.5	8.4
Snobnose pampano (cultured)	13.8	13.5
Hybrid red tilapia (cultured)	3.1	3.5
Seabass (cultured)	9.9	9.5
Slipper lobster	17.9	n/a
Blue swimming crab	6.5	6.0
Giant tiger shrimp:		
Small size		13.0
Medium size	16.9	16.0
Large size		25.0

Source: Data obtained during field market surveys by the author;
n/a = not available, meaning that the product form was not available during the market survey.

The retail market for traditional minced and surimi-based products includes fish balls, squid/cuttlefish balls, shrimp balls, fish cakes, stuffed vegetables with surimi, Foochow fish balls (cooked fish balls with chicken filling), surimi & crab balls, fish/shrimp spring rolls and surimi analogues. In addition, surimi-based dried snack products (locally processed and imported) are also offered; these are popular for parties and celebrations. The domestic market for surimi-based fishery products is expected to grow due to increased production capacity and quality improvement of locally made products, adequate price levels and regular availability of both imported and locally made products. In addition, an increasing number of working housewives and consumers want convenience seafood products, which are easy and quick to prepare at home. Public retail markets and supermarkets currently offer a good variety of traditional and minced, as well as surimi-based products.

In some large public markets, traditional small-scale production of freshly made minced fish paste is a common feature. The main species used are wolf-herring (*Chirocentrus dorab*), conger eel (*Congresox talabonoides*) spotted Spanish mackerel (*Scomberomorus guttatus*) and lizardfish (*Saurida spp.*). Retail prices of fresh minced fish were about S$8 to S$ 12 per kg depending on the fish species used. The shelf life[4] of minced fish paste and surimi-based products ranges from a few days at a temperature of 0 – 5°C to 3 – 12 months when frozen at –18°C. Table 27 shows the retail prices of selected value-added fishery products in Singapore during February 2000.

Table 27: Average Retail Prices of Chilled Value-added Fishery Products

Product	Price (S $/kg)
Dory fillets (trays)	7.7
Salmon fillets (trays)	16.9
Threadfin fillets (trays)	25.9
Cod steaks (trays)	27.9
Red snapper steaks	10.9
Stingray steaks (trays)	6.9
Conger eel steaks (trays)	4.7
Salmon heads/bone/tail (trays)	8.0
King crab legs (trays)	15.9
Cooked mussel meat (trays)	8.7
Squid fillets (skinless)	8.9
Scallops (half shell)	12.0
Scallop flesh	37.9
Oysters (half shell)	13.5
Fresh fish balls (trays)	4.5
Fried fish balls (trays/bags)	5.8 – 6.8
Prawn balls (trays/bags)	6.8
Cuttlefish balls (trays/bags)	6.5
Surimi and crab balls (trays)	7.8
Shrimp balls (trays)	8.5
Foochow fish balls (trays)	7.9
Imitation scallops (trays)	12.9
Softshell crab (4 pieces/tray)	21.0
Seasoned baby octopus (trays)	21.9
Seasoned squid slices (trays)	31.9

Source: Data obtained during field market surveys by the author and counterparts

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[4] Based on data on shelf lives of comminuted fishery products from "Southeast Asian Fishery Products", third edition, 1996, published by MFRD/ SEAFDEC.

Table 28 shows the average retail prices of red meats and poultry in Singapore during February 2000.

Table 28: Average Retail Prices of Meat and Poultry Products in Singapore (February, 2000)

Product	Price (S $/kg)
Red Meets:	
Lean pork	8.7
Pork loin	10.5
Beef loin	14.8 – 15
Beef, tender chuck	12.9 – 13
Minced beef	9.9
Lamb leg, chops	15.5
Poultry:	
Dressed chicken (chilled)	3.6
Chicken breast /chilled)	7.8
Chicken, drumstick (chilled)	5.5
Duck, dressed (chilled)	3.7 – 3.8

Source: Data obtained during field market surveys by the author and counterparts

4.4 Street Food Hawkers in Singapore

In 1971, a national programme aimed at building hawker food centres and markets to resettle licensed street hawkers provided basic stall facilities and services such as piped potable water and electricity supplies, waste collection and disposal. By 1996, all street hawkers had been completely resettled into food centres and markets. In 1988, there were about 23,331 hawkers operating in 184 public markets and food centres in Singapore, of which 8,878 were engaged in ready-to-eat vending operations. A total of 42 hawker food centres operated regularly in 1996. Official data on the number of licensed stalls in these hawker food centres is shown in Table 29.

Table 29: Licensed Stalls in Hawker Food Centres in Singapore (1996)

Type of Stalls	Number of stalls
Cooked food retail stalls	2,196
Market retail stalls:	479
i) Sundry goods	
ii) Market produce (e.g. Seafood, meat, whole fruits)	
iii) Market produce (e.g. Vegetables, eggs, bean cakes, noodles)	
Sub-total	**2,398**
Total	**5,073**

Source: Annual Report, 1996, Hawkers Department, Singapore

The set up and operation of Singapore's hawker food centres was aimed at upgrading the performance of hawkers through appropriate facilities, food control measures, and provision of training and adequate legislation. The Hawkers Department is the Government agency in charge of formulating and implementing policies on the operation, licensing and control of hawkers. This agency also inspects all hawker stalls and enforces the Environmental Public Health Act No. 32 (Chapter 95) of 1968, and its regulations (Environmental Public Health (Hawkers) Regulations, 1969), thus ensuring observance of good food hygiene practices. Regular training courses on food hygiene are part of an on-going programme organised by the Hawkers Department. This training is aimed at providing adequate guidance and technical assistance to food hawkers on proper food and personal hygiene practices. All stall holders and their assistants who are involved in the preparation and sale of food are required to attend and pass this food hygiene course. Since the introduction of this food hygiene course in 1990, up to 1996, the Hawkers Department has trained a total of 10,305 food handlers. About 290 – 300 stallholders and assistants from the hawkers' food centres attend and pass the food hygiene course each year.

Basic design features of market product stalls are mainly fixed type facilities, which resemble those found in the traditional public market retail stall. Potable water, wastewater drainage and electricity is provided to retail stalls, which have glazed tile walls, concrete slopped floors and adequate ventilation and lighting.

4.5 Live Fish Marketing and Basic Equipment

It is a well-known fact that live fish and shellfish commands a premium price because of its guaranteed quality, freshness and intrinsic flesh characteristics (better texture and delicate flavour) in comparison with fresh/chilled seafood. Primarily the tastes, traditions and cooking styles of the population (mostly Chinese in orgin) determine Singapore's live seafood market requirements. The consumption of live seafood is a niche market for affluent tourists, the upper class population and businessmen. The negative effects of the financial crisis in Asia are reflected in Singapore's trade of high-value live marine finfish, which has shown a declining trend in the last three years. With the gradual recovery of Singapore's economy, a positive trend in the domestic demand for high-value live marine finfish is expected.

The display of live seafood in aquariums has traditionally been an effective marketing device at restaurants and hotels (main outlets for live seafood sales) as well as in public food markets. Tourist seafood restaurants as well as traditional Singaporean seafood restaurants offer a large selection of live aquatic food, such as lobsters, mangrove crab, shrimp, oysters, snakehead, catfish, carps, seabass, groupers, snappers and other reef fish. For example, for the preparation of the very popular dish known as Singapore chilli crab, (which is offered as a speciality in most seafood restaurants), professional cooks use large live mangrove crabs (preferably ripe females). Most seafood banquet directors interviewed indicated that live fish is an important part of the menu for wedding banquets, company dinners and dances as well as birthday celebrations. Live fish are commonly gutted and either steamed or deep-fried, and generally are served with mixed vegetables and/or sauces. In general, live fish with firm flesh, low fat content, and fine-grained skin are preferred. It should be mentioned that some species of live cultured fish are considered inferior to wild live fish and fetches slightly lower prices; this is particularly evident with groupers. There is a premium price on size, with larger fish (within the range of 1 – 2 kg) often commanding higher prices than smaller fish.

4.5.1 Vivier Boats

Live marine fish is harvested either by scoop net or lifting cage culture nets. The fish is than transported by small vivier boats to the landing centres. The boats are equipped with small fibreglass-reinforced plastic (FRP) containers/tanks and two (2) pure oxygen cylinders. Live marine fish (mainly groupers, tilapia, mullets, snappers and seabass) collected from fish farms are transferred manually to the FRP tanks filled with clean seawater, adequately oxygenated. On average, trips from fish farms to the Changi ferry terminal landing centre last about 1 – 2 hours. The average market size of cultivated marine fish is shown in Table 30.

Table 30: Average Market Size of Cultivated Marine Fish

Species	Market Size (g/piece)
Grouper	600 – 1,000
Seabass	600 – 1,000
Tilapia	400 – 600

Source: data from market surveys conducted by the author and counterparts

4.5.2 Vivier Trucks

Currently, live marine fish are transported in seawater from the landing centres by vivier trucks. The main features of vivier trucks include aerated seawater tanks mounted on flatbed trucks. The majority of tanks used in Singapore are locally made from fibreglass-reinforced plastic (FRP) or aluminium.

The open transport tanks require aeration to maintain adequate dissolved oxygen levels. For this purpose, the following equipment is used: mechanical water pumping systems to circulate the water and provide aeration to the fish tanks powered by the truck's engine and pure oxygen through oxygen cylinders connected to the tanks through flexible plastic hoses. A typical example of a live marine transportation system is as follows:

a) Truck: A five tonne payload flatbed truck equipped with six vivier tanks (made of fibreglass reinforced plastic, with aeration fittings and air distributors/diffusers on the bottom, and water drainage)

b) Small water pump powered by the truck's engine

c) Oxygen cylinders (two) connected to the tanks through flexible plastic hoses

d) Scoop nets (stainless steel frames and nylon netting)

e) Weighing baskets

On arrival at the landing centre (Changi ferry terminal), the live fish is sorted by species and size and distributed to wholesalers, retail markets and restaurants at mutually agreed prices. Any fish which are not sold are kept in vivier tanks which are equiped with circulatory and aerating systems similar to those installed in the vivier trucks. The fish are normally fed minced fish. During the entire collection, storage and distribution operations, the handling of the live fish is reduced to a minimum to avoid excessive injuries. At the retail or restaurant destination, the fish is transferred to aquariums or portable containers until sold or required for human consumption. Wild-caught live fish such as groupers, snappers, parrotfish and coral fishes are handled in the same way as the live cultured marine fish. In addition, live lobsters, prawns, mud crab and groupers which are air flown from neighbouring countries are also handled and distributed at the Changi ferry terminal. It is estimated that on average, 500 kg/day of live marine fish are landed at the terminal.

4.5.3 Retail Outlets for Live Fish and Shellfish

The main retail outlets for live fish and shellfish are the public markets and some supermarket chains. Retail competition is intense, with a high concentration of sophisticated retailers. There is also substantial foreign investment in this sector, in particular, in supermarkets and shopping malls. However, public markets still play a major role in retailing live seafood.

For example, NTUC Fair Price, which is the largest supermarket chain in Singapore, offers a good variety of live seafood such as spiny lobster, blue swimming crab, mangrove crab, crayfish, giant tiger shrimp and tilapia.

The equipment used for display of live seafood at supermarkets include mainly display tanks. The live seafood distributors supply these units to supermarkets on a loan basis. The largest display unit is equipped as follows:

- Three glass-sided fibreglass display tanks (rectangular in shape)
- One water pump (for water circulation)
- One mechanical filter
- Three-tiered waterfall aerators
- One water chiller

This large unit can hold about 30 to 50 kg of lobsters or giant tiger shrimp. The display tank units are an important promotional tool in the retail seafood section and an effective assurance to consumers of the good quality of the live seafood being offered. Simple glass aquarium tanks equipped with air pumps are also used for displaying live tilapia and crabs in some smaller supermarkets. These highly visible display units have boosted live seafood sales at most of the NTUC Fair Price supermarkets.

At public markets, the equipment used for display of retail live seafood at supermarkets include mainly aquarium units, portable FRP tanks and plastic containers. Aquarium display units are either metal-framed glass tanks or plexiglass tanks (with silicone rubber adhesive sealed joints), the latter being more commonly used. According to these retailers, most of the display units are equipped with air pumps to maintain adequate oxygen levels. However, mud crabs are either kept in their original packaging boxes or in plastic containers without water. During retail operations, the main control measures for live crabs are to keep them moist and cool all the time and prevent injuries caused by rough handling. Mud crabs survive best in an environment of about 70 – 80% relative humidity. Lower temperatures are achieved by the use of chilled moistened materials placed at the bottom of the storage box. Usually, the storage boxes are provided with ventilation holes at the top. On arrival at the public markets, mangrove crabs are carefully examined and weak or dead crabs are removed from the boxes and either chilled or cooked. Live mangrove crabs are tied with raffia; this reduces cannibalism, physical damage and movement during distribution and marketing operations.

Live freshwater fish such as carps, catfish and snakehead supplied from Malaysia and Thailand are very popular in public markets. These species are also displayed in aquarium tanks, FRP tanks or plastic containers. Catfish and snakehead can survive for prolonged periods out of water, provided they are kept moist and relatively cool. Adequate preventive measures must be used to avoid injuries due to rough handling.

Daily supplies of live seafood are delivered to public markets to replenish the stocks; on average each retailer holds stocks of live seafood for at least two working days.

Our limited seafood retailer's survey indicated that mainly men operate the retail seafood stalls in Singapore. A limited gender analysis showed that most women and men run seafood retail vending as a family business.

4.6 Consumer Promotion Tools for Retailing Surimi-based Products

The "*Pick and Choose Yong Tau Foo*" sales promotion scheme is the main consumer promotion tool currently used for surimi-based products at retail level, in particular, supermarkets. This sales promotion scheme consists in offering a wide selection of surimi-based products (including seafood analogues) together with the traditional and very popular Chinese bean curd products at a fixed price of S$ 1.50 for 10 pieces of any of these products. This sales promotion scheme offers consumers savings off the regular price for surimi-based seafood products. It takes the form of a reduced price pack, in which two non-related products (surimi-based products and traditional bean curd products) are banded together. The common use of both types of products in the preparation of traditional Chinese soups makes this sales promotion scheme very effective in stimulating regular sales. Product assortment and quality level are key elements for the success of this sales promotion scheme in a very competitive market. These perishable products are usually displayed chilled; therefore, adequate care needs to be exerted in handling, storage and display to match the target market's expectations. Dealing with a line of highly perishable products, shop managers are supposed to know what consumers want, what products to stock and how much is needed daily, to ensure product freshness. In addition, seafood section staff are supposed to carefully monitor the shelf lives of each product, to ensure that high quality items are displayed.

The following chilled surimi-based and bean curd products were offered in NTUC Fair Price supermarkets during the month of February, 2000.

- Fish balls (*yu yuan*)
- Cuttlefish balls (*xu tong yuan*)
- Fish cake (*yu ping*)
- Fish dumpling with chicken filling (*yu qiao)*
- Imitation scallops (*jia yu zhu*)
- Imitation crab (*jia pang xie ru*)
- Fish rolls (*yu tiao*)
- Shrimp rolls *(xiao tiao*)
- Fresh chillies filled with surimi (*sheng la jiao yu jiang*)
- Fresh ladies' fingers filled with surimi (*jang qiao dou sai yu jiang*)
- Fried dou foo (*ja dou foo*)
- Fresh dou foo (*sheng dou foo*)
- Surimi and crab balls (*yu jiang he pang xie yuan*)
- Fish balls filled with minced chicken (*yu yuan zhan qi ro*)

This self-selection sales promotion scheme operates as follows:

i) Consumers at the seafood section are encouraged to examine what is on offer and make their own choice of value-added products. With the help of a plastic pincer, the consumer can select the products and place them on a polystyrene tray. The display of products in refrigerated display cabinets is arranged so that consumers can easily examine all type of products

ii) The seafood section staff checks the contents, wraps the tray with a plastic film, then labels the tray with a sticker

iii) The consumers include the tray with other grocery items for final payment as they leave the supermarket.

This self-service retailing scheme with limited sales assistance has lower operating expenses because of less staff requirement. The retailer makes up for the reduced profit margin by achieving a high volume of sales. In addition, consumers are willing to carry out their own locate-compare-select process of value-added fishery products, on the understanding that they can save money. In general, traditional bean curd products are bought with little regard to significant brand differences, which can be described as habitual buying behaviour. Therefore, some supermarkets find it effective to use price and sales promotions to stimulate non-branded product trials (in particular, seafood analogues), since buyers are not committed to any brand. This marketing strategy also encourages variety-seeking buying behaviour by offering lower price packs.

4.7 Training Activities for Seafood Retailers

Several training courses on fish handling and quality preservation for fish retailers from local supermarket chains have been organised by MFRD, SEAFDEC and PPD since 1986. The trainees included seafood section supervisors, shop-front staff and shop managers. The content of these courses was tailored to suit different levels of staff. Details of the first two training courses are shown in Table 31.

4.8 Food Retail Inspection Services

Currently the Food Control Department conducts regular surveillance and enforcement programmes to ensure that safe and wholesome food is sold at retail establishments. Regular food sampling at storage and retail shops is conducted, and samples are checked through physical, microbiological and chemical analysis. Spot-checks at warehouses, supermarkets and public markets include evaluation of food storage condition and quality, labelling requirements and storage temperatures. At present all cooked food vendors are subject to a demerit point system of quality inspection. Figure 65 shows the Food Control Department Organization chart.

Figure 65: Singapore's Food Control Department Organisation Chart

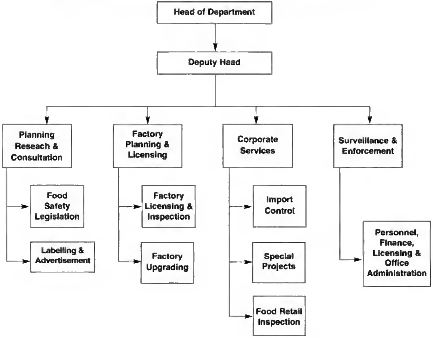
Head of Department
Deputy Haad
Planning Reseach & Consultation
Factory Planning & Licensing
Corporate Services
Surveillance & Enforcement
Food Safety Legislation
Labelling & Advertisement
Factory Licensing & Inspection
Factory Upgrading
Import Control
Special Projects
Food Retail Inspection
Personnel, Finance, Licensing & Office Administration

Table 31: FAO/FIIU Study on Low-cost Fish Retailing Equipment and Facilities for Improving Fish Marketing in Urban Areas of South East Asia

Training Programmes for Seafood Vendors
Country/City: Singapore

Course (s) Content	Training Methodology / Equipment / Training Materials	Results Obtained
1ST FISH RETAILERS TRAINING COURSE (1st, 3rd and 5th Dec 1986)	The course was conducted through a series of lectures, experiments and demonstrations. Transparencies, printed lecture notes and handouts were used.	i) Qualitative evaluation: Yes [✓] No [ ] At the end of the course, feedback from trainees was obtained through a Course Review form. ii) Quantitative evaluation: Yes [ ] No [✓]
1/12/1986: Day 1 *13:30 – 14:00:* Registration *14:00 – 15:15:* Lecture 1 *15:15 – 15:30:* Tea break *15:30 – 17:00:* Practical session 1. Set-up experiment 1 2. Set-up experiment 2 3. Set-up experiment 3 4. Demonstration 1	**Lecture 1**: Concept of freshness 1. Endogenous factors influencing quality changes at post mortem; 2. Exogenous factors influencing quality changes at post mortem 3. Methods to measure quality changes **Lecture 2:** 1. Spoilage changes during icing 2. Spoilage changes during slow freezing 3. Spoilage changes during freezing and long/short term frozen storage 4. Handling of chilled and frozen fish at retail counters in relation to quality	
3/12/1986: Day 2 *14:00 –15:30:* Lecture 2 *15:30 – 15:45:* Tea break *15:45 – 17:00:* Practical session 1. Observation of results of experiment 1 2. Observation of results of experiment 2 3. Demonstration 2 4. Demonstration 3	**Experiment 1**: To demonstrate the stages in the spoilage of fish at 0°C and 10°C. **Experiment 2**: To demonstrate the influence of initial quality on the final quality of frozen fish **Experiment 3**: To demonstrate the presence of bacteria in unwashed/dirty fish	
5/12/1986: Day 3 *14:00 – 14:45:* Practical session 1. Observation of results of experiment 1 2. Observation of results of experiment 2	**Demonstration 1**: Static displays showing: 1. How bacteria multiply 2. Sources of bacteria and how to reduce contamination at retail store 3. Conditions of a putrid fish due to bacterial spoilage.	

Course (s) Content	Training Methodology / Equipment / Training Materials	Results Obtained
3. Discussion of results of experiment 3	**Demonstration 2:** Influence of fluctuating temperatures during frozen storage.	
14:45 –15:30: 1. Conclusion of experiment 1 2. Conclusion of experiment 2 3. Discussion of results of experiments 1 & 2 *15:30 – 15:45:* Tea break *15:45 – 16:45:* Presentation by trainees on their current practices with regards to purchasing, transport, storage and display of chilled and frozen fish and fish products. This will be followed by a general discussion on common problems faced and possible solutions. *16:45 – 17:00:* Closing of course	**Demonstration 3:** Effects of slow freezing and partial freezing	
2ND TRAINING COURSE FOR LOCAL FISH RETAILERS (20 – 27 April 1987)	The course was conducted through a series of lectures, experiments and demonstrations. Transparencies, printed lecture notes and handouts were used.	i) Qualitative evaluation: Yes [✓] No [ ] At the end of the course feedback from trainees were obtained through a Course Review form.
20/4/1987 (Mon): Day 1 *13:30 – 14:00:* Registration & briefing *14:00 – 15:00:* Lecture 1 *15:00 – 15:15:* Tea break *15:15 – 16:45:* Lecture 2 *16:45 – 17:00:* Discussion	**Lecture 1:** Concept of freshness 1. Endogenous factors influencing quality changes at post mortem; 2. Exogenous factors influencing quality changes at post mortem 3. Methods to measure quality changes	ii) Quantitative evaluation: Yes [ ] No [✓]
22/4/1987 (Wed): Day 2 *13:30– 15:00:* Practical 1 1. Experiment 1 (Fish Quality) 2. Experiment 2 (Initial Quality) *15:00 – 15:15:* Tea break *15:15 – 17:00:* Practical 2	**Lecture 2:** Quality Preservation 1. Principles of icing 2. Spoilage changes during icing 3. Principles of freezing 4. Spoilage changes during freezing and long/short term frozen storage	

Course (a) Content	Training Methodology / Equipment / Training Materials	Results Obtained
1. Experiment 3 (Bacteriology) 2. Demonstration 1 (Bacteriology) **24/4/1987 (Fri): Day 3** *13:30 – 14:30:* Lecture 3 *14:30 – 14:45:* Discussion *14:45 – 15:00:* Tea break *15:00 – 17:00:* Practical 3 1. Experiment 4 (Physical examination) 2. Experiment 5 (Spoilage & temperature) 3. Demonstration 2 (Frozen storage & quality) **27/4/1987 (Mon): Day 4** *13:30 – 14:30:* Lecture 4 *14:30 – 15:00:* Discussion *15:00 – 15:15:* Tea break *15:15 – 16:45:* Practical 4 1. Continuation of Experiment 2 2. Continuation of Experiment 5 *16:45 – 17:00:* Closing of course	**Lecture 3:** Cleanliness & sanitation 1. General principles of hygiene and sanitation practices for retail store personnel 2. Relationship between hygiene and product quality **Lecture 4:** Quality Control at Retail Store 1. Types of display counters, display lighting and quality control 2. Display methods for chilled and frozen fish 3. Stock control and storage **Experiment 1:** To ascertain quality consciousness amongst trainees. **Experiment 2:** To demonstrate the influence of initial quality on the final quality of frozen fish **Experiment 3:** To demonstrate the presence of bacteria in unwashed fish **Experiment 4:** Physical examination of fish quality **Experiment 5:** To demonstrate the stages of spoilage at 0°C and 15°C. **Demonstration 1:** Bacterial contamination. **Demonstration 2:** Influence of fluctuating temperature during frozen storage. **Poster display:** 1. Chart explaining how bacteria multiplies 2. Sources of contamination during commercial handling of fish 3. Proper handling practices 4. Fish display and common mistakes 5. Suggestions for a full service seafood department 6. Suggestions for a self service seafood department 7. What is slow freezing 8. What is partial freezing	

Course (s) Content	**Training Methodology / Equipment / Training Materials**	**Results Obtained**
IN-HOUSE RETAILERS' TRAINING COURSE (20 – 27 July 1987 and 16 – 24 Sep 1987) **Day 1:** *9:00 – 9:30:* Registration *9:30 – 10:15:* Lecture 1 *10:15 – 10:30:* Tea break *10:30 – 12:00:* Lecture 2 *12:00 – 13:00:* Lunch *13:00 – 14:00:* Video 1 & discussion *14:00 – 15:00:* Lecture 3 *15:00 – 15:15:* Tea break & Poster display 1 *15:15 – 16:30:* Practical 1 *16:30 – 17:00:* Review of day's work & short objective Test I **Day 2:** *9:00 – 10:00:* Lecture 4 *10:00 – 10:15:* Tea break *10:15 – 11:00:* Lecture 5 *11:00 – 11:10:* Break *11:10 – 12:10:* Lecture 6 *12:10 – 13:00:* Lunch *13:00 – 14:30:* Lecture 7 *14:30 – 15:30:* Practical 2 *15:30 – 15:35:* Tea & Poster display 2 *15:35 – 16:30:* Lecture 8 *16:30 – 17:00:* Review of day's work & short objective Test II **Day 3:** *9:00 – 10:15:* Lecture 9 *10:15 – 10:45:* Tea break & poster display 3 *10:45 – 12:00:* Lecture 10 *12:00 – 13:00:* Lunch *13:00 – 14:15:* Lecture 11 *14:15 – 15:30:* Practical 3 *15:30 – 15:45:* Tea & Poster display 3	The course was conducted through a series of lectures, videotapes, experiments and demonstrations. Transparencies, printed lecture notes and handouts were used. The materials of this course were used for the Training Manual on Fish Quality Preservation. **Lecture 1:** Introduction **Lecture 2:** Concept of freshness 1. Endogenous factors influencing quality changes at post mortem; 2. Exogenous factors influencing quality changes at post mortem 3. Methods to measure quality changes **Lecture 3:** Concept of quality (Part 1) **Lecture 4:** Concept of Quality (Part 2) **Lecture 5:** Concept of wholesomeness **Lecture 6:** Concept of nutritive value **Lecture 7:** Freshness of squid **Lecture 8:** Fish quality preservation – Icing (Part 1) **Lecture 9:** Icing (Part 2) **Lecture 10:** Freezing (Part 1) **Lecture 11:** Freezing (Part 2) **Lecture 12:** Hygiene and sanitation **Lecture 13:** Quality Control at Retail Store (Part 1) **Lecture 14:** Quality Control at Retail Store (Part 2) **Practical 1:** Physical examination of ice stored fish **Practical 2:** Demonstration on bacterial spoilage effects on fish	i) Qualitative evaluation: Yes [✓] No [ ] At the end of the course feedback from trainees were obtained through a Course review form. ii) Quantitative evaluation: Yes [✓] No [ ] Three tests were conducted at the end of each of the first 3 days to assess trainees' understanding.

Course (s) Content	Training Methodology / Equipment / Training Materials	Results Obtained
15:45 – 16:30: Video 2 & discussion *16:30 – 17:00:* Review of day's work & short objective Test III **Day 4:** *9:00 – 10:30:* Lecture 12 *10:30 – 10:45:* Tea break & Poster display 4 *10:45 – 12:00:* Lecture 13 *12:00 – 13:00:* Lunch *13:00 – 14:00:* Lecture 14 *14:00 – 16:00:* Practical 4 *16:00 – 17:00:* Course evaluation & closing	**Practical 3:** Demonstration on the influence of fluctuating temperatures during frozen storage. **Practical 4:** Organoleptic test of iced fish **Poster display 1:** Chart explaining how bacteria multiplies Sources of contamination during commercial handling of fish **Poster display 2:** Proper handling practices Fish display and common mistakes **Poster display 3:** Suggestions for a full service seafood department Suggestions for a self service seafood department **Poster display 4:** What is slow freezing What is partial freezing	
IN-HOUSE RETAILERS' TRAINING COURSE – TRAIN THE TRAINERS (11–13 April 1989) **11/4/1989: Day 1** *9:00 – 10:00:* Lecture 1 *10:00 – 10:30:* Demonstration 1 *10:30 – 11:00:* Coffee break *11:00 – 12:00:* Lecture 2 *12:00 – 13:00:* Demonstration 2 **12/4/1989: Day 2** *9:00 – 10:00:* Lecture 3 *10:00 – 10:30:* Demonstration 3 *10:30 – 11:00:* Coffee break *11:00 – 12:00:* Lecture 4 *12:00 – 13:00:* Demonstration 4	The course was conducted through a series of lectures and demonstrations. Transparencies, printed lecture notes and handouts were used. The materials of this course were based on the first draft of the Training Manual on Fish Quality Preservation. **Lecture 1:** 1. Introduction 2. Post-mortem changes and physical examination 3. Time-temperature-tolerance **Lecture 2:** Fish quality preservation and appropriate handling methods 1. Principles and methods of icing 2. Principles and methods of refrigeration 3. Principles and methods of freezing 4. Spoilage characteristics of iced, refrigerated and frozen fish 5. Handling during icing, refrigerating and freezing 6. Handling thawed fish	i) Qualitative evaluation: Yes [✓] No [ ] At the end of the course, feedback from trainees were obtained through a Course Review form. ii) Quantitative evaluation: Yes [ ] No [✓]

Course (s) Content	Training Methodology / Equipment / Training Materials	Results Obtained
13/4/1989: Day 3 *9:00 – 10:00:* Lecture 5 *10:00 – 10:30:* Demonstration 5 *10:30 – 11:00:* Coffee break *11:00 – 11:45:* Lecture 6 *14:45 – 13:00:* CASE STUDY – Assessment of existing conditions in one supermarket outlet; CONCLUSION	**Lecture 3:** 1. Concept of wholesomeness 2. Hygiene and sanitation Part 1 **Lecture 4:** Hygiene and sanitation Part 2 **Lecture 5:** Quality Control at retail store **Lecture 6:** Handling of selected processed products **Demonstration 1:** Time-temperature-tolerance. Physical examination of ice stored fish **Demonstration 2:** Quality deterioration due to frozen storage **Demonstration 3:** Concept of wholesomeness **Demonstration 4:** Hygiene and sanitation practices **Demonstration 5:** Quality control at retail store (slide show)	

Source: Dr. Low Lai Kim, Primary Production Department (PPD), Singapore

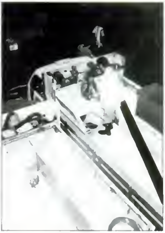

Figure 66. Overall view of an operational vivier truck. Jurong wholesale fish market, Singapore.

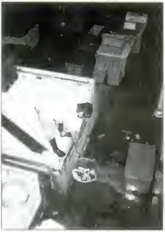

Figure 67. Unloading of live fish (seabass) from a vivier truck. Jurong wholesale fish market, Singapore.

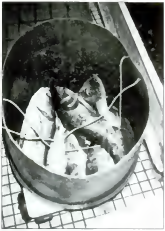

Figure 68. Typical container used for transferring live fish from vivier trucks to auction halls. Jurong wholesale fish market, Singapore.

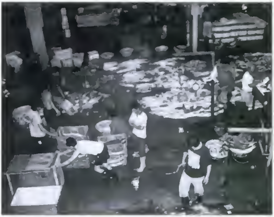

Figure 69. Overall view of the operations at a fish auction hall. Jurong wholesale fish market, Singapore.

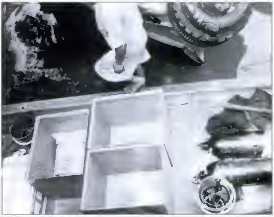

Figure 70. Side view of a live fish collection boat, equipped with oxygen cylinders. Singapore.

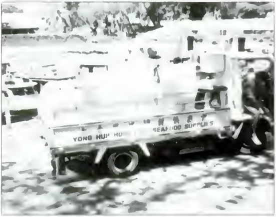

Figure 71. Overall view of a live fish and shellfish vivier truck used for local distribution to restaurants and retail markets, Singapore.

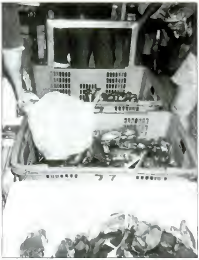

Figure 72. Handling live mangrove crabs, Senoko wholesale fish market, Singapore.

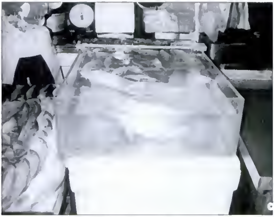

Figure 73. Display of live fish in aquariums. Public food market, Singapore.

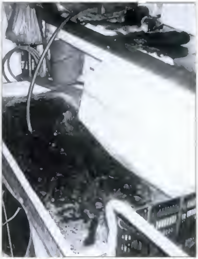

Figure 74. Overall view of fibreglass live fish holding tank with aeration system. Public food market, Singapore.

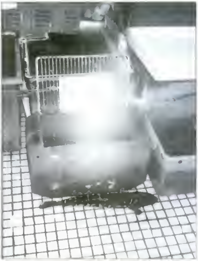

Figure 75. Typical low-cost container for handling and display of live fish. Public food market, Singapore.

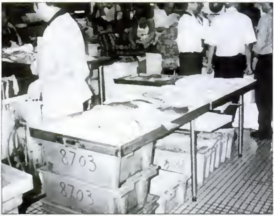

Figure 76. Display of fresh fish on stainless steel display tables. Public market, Singapore.

Figure 77. Overall view of a typical fresh fish retail stall. Public market. Singapore.

Figure 78. Manual filleting and deboning operations at a minced fish retail stall. Public food market. Singapore.

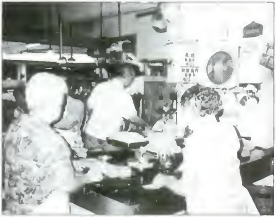

Figure 79. Overall view of a typical minced fish retail stall. Public food market, Singapore.

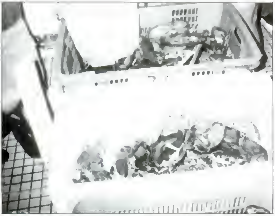

Figure 80. Display of live mangrove crab in HDPE and expanded polystrene boxes. Public food market, Singapore.

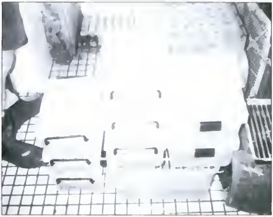

Figure 81. Display of live fish in HDPE boxes with cover. Public food market, Singapore.

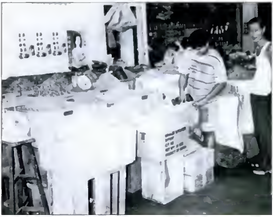

Figure 82. Overall view of a typical cured fish wholesale stall, Singapore.

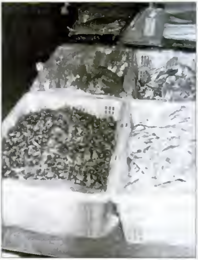

Figure 83. Display of dried fish using a folding trestle table. Wholesale food market, Singapore.

5. CASE STUDY: BANGKOK

5.1 Introduction

Bangkok was designated as the royal city of the Kingdom of Thailand in 1782, by King Rama I. Since then, Bangkok has grown through the years and the most dramatic growth has occurred since the mid-1900s. Despite Bangkok's modern features and numerous shopping complexes, this fast-growing metropolis still maintains much of its magnificent temples and palaces. Greater Bangkok has an estimated population[1] of 10 million in the year 2000, which represents about 16 percent of the total country's population. According to latest estimates, the total projected population of the Kingdom of Thailand[2] for 2000 is about 61.23 million.

In general economic terms, Thailand was one of the countries in Asia worst hit by the economic crisis in the region. The authorities had to strengthen the social safety net by supporting priority areas in rural and urban sectors in order to augment broader agricultural and fisheries production and industrial restructuring. They accelerated the social investment programme targeted at addressing unemployment. With an average per capita gross domestic product (GDP) of US$ 1,901 in 1998, only Japan, Singapore, Korea, Chinese Taipei, Brunei Darussalam, Malaysia and Hong Kong, China had higher per capita GDP among the Asian countries.

According to the official figures of the Department of Fisheries, in 1997, Thailand exported US$ 5 billion worth of fishery products, therefore maintaining its supremacy as the world's leading exporter of seafood products. Bangkok supports a substantial market for live, fresh, frozen and cured fish and canned fishery products. In 1997, FAO fisheries statistics reported an apparent annual per capita fish supply of 29.5 kg in the Kingdom of Thailand. A breakdown of the data is shown in Table 32, with pelagic fish at the top in terms of per capita supply among seafood, followed by freshwater fish.

Table 32: Fish per Capita Supply (1997)

Food Item	Annual per Capita Supply (kg/year)
Freshwater fish	6.43
Demersal fish	2.93
Pelagic fish	12.3
Marine fish, other	0.73
Crustaceans	2.72
Cephalopods	2.05
Molluscs, other	2.36
Total Fish	**29.5**

Source: FAO Food Balance Sheets, 1994-97

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[1] Population projections for Bangkok, from published data of 7,400,00 inhabitants for the year 1990, Encarta 2000 Encyclopedia.

[2] Based on the total midyear population data for the year 2000 (61,230,874 inhabitants); international database of the US Bureau of the Census, International Programs Center. (http://www.census.gov).

Table 33 shows the national meat and eggs per capita supply in 1997. When comparing meats with seafood products, the highest per capita supply item was poultry meat (including chicken, duck and other birds) with 15.52 kg/year, followed by pelagic fish with 12.3 kg/year.

Table 33: Meat and Eggs per Capita Supply (1997)

Food Item	Annual per capita Supply (kg/year)
Beef and Veal	4.62
Mutton and Goat Meat	0.01
Pork	6.26
Poultry Meat	15.52
Other meat	—
Eggs	9.00

Source: FAO Food Balance Sheets, 1994-97[3]

5.2 Fish Distribution Channels

The domestic market for fish and fishery products is distinguished principally by the dependence on supplies from commercial fisheries, aquaculture and small-scale fisheries. It should be noted that a significant proportion of aquaculture produce, particularly shrimp, is exported. The strong export orientation of the Thai fisheries sector has limited the supplies available for domestic consumption. To counteract this trend, the development of aquaculture and improved utilisation of fish by-catches for direct human consumption is being encouraged.

Both freshwater and marine fish and fishery products are regularly traded in Bangkok's domestic fish market. Chilled and live fish are landed at the Bangkok wholesale fish market, located on the bank of the Chao Phraya River. The Fish Marketing Organization (FMO), a state-owned enterprise, is in charge of the management and operation of the Bangkok wholesale fish market and of related fish marketing affairs. This wholesale market handles about 105,000 to 157,000 metric tonnes of fish annually. Estimated total daily volumes of fish traded in the Bangkok wholesale fish market vary according to the fishing season, from about 290 to 360 tonnes, of which about 129 tonnes of freshwater fish are traded daily. The wholesale fish market is equipped with two main trading halls, where the fish agents or commission agents display and trade fish. Fish at the wholesale marketing halls is sold mainly by auction or through negotiated prices in public sales conducted by brokers, who sell to retailers, institutional buyers, processors and seafood traders. Fish is usually graded according to different sizes (large, medium and small). Shrimp are often classified into "small", "medium" or "large," while the industry sizing is based on count-per-pound of headless shrimp. During field visits, most head-on black tiger shrimp auctioned at the Bangkok wholesale market were 35 – 40 or 40 – 60 pieces/kg, while smaller shrimp were also available. Table 34 shows the average wholesale prices of selected fish in Bangkok during December 1999 to January 2000.

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[3] Based on FAO statistical database (http://www.fao.org).

Domestic shrimp and freshwater prawn consumption has declined after the economic recession. Decreases in the standard of living and disposable incomes typically result in lower high value seafood consumption in most markets. This is reflected in the lower sales of these products reported at public retail markets as well as in the catering sector during the last two years. However, increased domestic demand for shrimp and freshwater prawn is forecast, given that the Thai economy is projected to recover gradually, with a growth rate[4] of 3 percent in terms of the real GDP in 2000.

Table 34: Average Wholesale Prices of Selected Seafood in Bangkok
Period: December 1999 – January 2000

Species	Wholesale Price (Baht[5]/kg)
Indian Mackerel	7 – 35
(Rastrelliger kanagurta)	(18)
Spanish Mackerel	8 – 60
(Scomberomorus spp.)	(29)
Threadfin	50 – 125
(Nemipterus spp.)	(90)
Seabass	60 – 140
(Lates calcarifer)	(105)
Red snapper	50 – 115
(Lutjanus spp.)	(95)
White Pomfret	120 – 320
(Pampus argenteus)	(255)
Black Pomfret	25 – 75
(Formio niger)	(65)
Mangrove Crab	85 – 120
(Scylla serrata)	(110)
Squid	30 – 100
(Loligo spp.)	(65)
Snakehead (live)	40 – 70
(Ophicephalus striatus)	(60)
Catfish (Live)	30 – 35
(Clarias spp.)	(35)
Striped Catfish (Live)	8 – 18
(Pangasius sutchi)	(16)
Eels (Live)	60 – 80
(Fluta alba)	(70)
Tilapie	7 – 38
(Oreochromis spp.)	(30)
Giant Freshwater Prawn (Live)	Small: 90 – 110
(Macrobrachium rosenbergii)	Medium: 220 – 245
	Large: 505 – 540
Black Tiger Shrimp	Small: 125 – 190
(Penaeus monodon)	Medium: 250 – 300
	Large: 400 – 450
Banana Shrimp	Small: 120 – 190
(Penaeus merguiensis)	Medium: 240 – 270
	Large: 380 – 430

Source: Fish Marketing Organization (FMO), Thailand

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[4] Based on the 1999 *APEC Economic Outlook*

[5] In February 2000, the rate of exchange was US$ 1.00 equal to 37.9 Baht.

Table 35 shows the distribution pattern for fresh fish from the Bangkok wholesale market, with a significant proportion of supplies distributed to the city's retail markets.

Table 35: Distribution of Fresh Fish from Bangkok Wholesale Market
Period: January – December1998

Destination	Percentage (%)
Retailers:	86.00
Bangkok retail markets	77.40
Provincial retail markets	8.33
Cold storage	0.27
Processing plants & exporters:	10.89
Bangkok	4.12
Provincial	6.77
Others	3.11
Total	**100.00**

Source: Fish Marketing Organization (FMO) of Thailand

There is a significant domestic live fish trade, which is handled by private wholesalers. Most traders operate live fish carriers (trucks with tanks and aeration systems), collecting freshwater fish such as snakehead (*Ophicephalus striatus*), tilapia, carps, catfish, climbing perch, swamp eels and sand goby, as well as seabass (*Lates calcarifer*) produced by aquaculture farms and floating cages. The domestic live shellfish trade comprises molluscs such as cultivated green mussel (*Perna viridis*), cockles (*Arca granulosa*), hard clam (*Meretrix meretrix*) and oysters (*Crassostrea spp.*). Crustaceans include mangrove crabs (*Scylla spp.*), swimming crabs and giant freshwater prawn (*Macrobrachium spp*). Most of the production of giant freshwater prawn, oysters, cockles and mussels are sold in live form while a relatively limited proportion of bivalves is sold as shucked flesh, either fresh or dried.

There is also an important processed seafood market in Bangkok for products such as fish sauce, fermented fish and fermented shrimp paste; steamed, dried-salted fish, shrimp and squid; fish balls, fish fingers, fish noodles, imitation crab meat, value-added shrimp products and surimi-based traditional products.

Thailand has become highly reliant on imports of frozen fish (mainly tuna, which account for over 80 percent of the tuna used for canning) to satisfy the local fish canning industry demand. Canned fish, in particular tuna, mackerel and sardine products, are offered in most supermarket chains, public markets and small grocery retail outlets. The overall demand for canned fishery products in Thailand is relatively small, but in Bangkok there is a relatively higher consumption level. Most high-value canned products are packed in two-piece cans with easy-open tops and attractive labels.

The major available canned seafood packs include the following:

- Sardine/scad in tomato & chilli sauces, in round/oval/rectangular cans
- Mackerel in tomato sauce or in vegetable oil, in round/oval/rectangular cans
- Tuna in oil, solid, chunk and grated packs, in round cans with net contents of 180 g
- Tuna in either curry with coconut milk or hot and spicy sauces, in round cans
- Squid/cuttlefish/octopus in brine; in round cans
- Baby clams in brine, in round cans
- Crab meat in brine, in round cans
- Shrimp in brine, in round cans

Table 36 shows the average retail prices of selected canned fish packs offered in Bangkok.

The consumption habits in Bangkok vary according to the socio-economic level of the population, with upper and middle class homes showing strong preference for high value tuna, crab, squid, baby clams and shrimp packs. Lower income consumers prefer cheaper sardine and tuna products. Canned tuna, shrimp, baby clams, and squid/cuttlefish products are usually consumed with cooked rice, as a salad or sautéed with vegetables. Canned sardines are frequently served with cooked rice or bread as a snack, as well as sautéed with vegetables.

Table 36: Average Retail Prices of Canned Seafood Products in Bangkok
Period: May – June 2000

Product Form	Retail Price (Baht /can) (155 g. net contents)	Retail Price (Baht/can) (185 g. net contents)
Sardines in tomato sauce	10	n/a
Tuna in mayonnaise	n/a	25
Tuna in curry sauce	n/a	25
Tuna in oil, solid pack		30
Tuna in oil, chunks	n/a	25

Source: field surveys carried by counterparts

Seafood reaches consumers in Bangkok through a multi-level system, which may involve at least three to four transactions before a fish or fishery product is purchased by consumers in a public fish market or supermarket, or eaten at a restaurant/food stall. The channels of distribution incorporate locally caught and processed seafood, as well as live and chilled cultured species.

5.3 Bangkok's Retail Fish Market

The Bangkok urban area is home to a variety of retail establishments offering live, fresh, frozen, cured and canned seafood to consumers. The range of shopping options includes public retail markets, supermarkets and street hawkers that offer a wide selection of fish and fishery products. Public markets and street vending currently hold a significant share of the retail market of chilled and live fish, fresh, fermented and cured fishery products. Large supermarket chains and medium-sized independent supermarkets offer mainly chilled, frozen, cured, fermented, processed (surimi-based fishery products, dried seafood snacks, and roasted squid/cuttlefish) and canned seafood. Supermarkets currently hold a fairly low portion of the retail market share of chilled fish and fishery products, but sales of surimi-based products, snacks and canned seafood are significant. Most supermarkets have well-defined seafood product sales strategies, including adequate product mix and variety of frozen and fermented fish products, fish sauce, surimi-based products, roasted squid/cuttlefish, dried snacks and canned seafood products.

Table 37 shows the estimated distribution of retail outlets in Bangkok, according to data provided by the Bangkok Metropolitan Administration (BMA).

Table 37: Estimated Number of Retail Outlets in Bangkok

Type of Retail Outlet	Number
Wet (public/municipal) markets	154
Supermarkets	107
Minimarkets	700
Minimarkets (within petrol stations)	300
General grocery stores	17,000
Total	**18,261**

Source: BMA, March 2000

The most popular product form is whole fresh fish; the species most in demand are: catfish, snakehead, gourami, Spanish mackerel, Indian mackerel, tuna, squid, cuttlefish, red snapper, groupers, cockles, arc shells, topshells, mussels, shrimps and giant freshwater prawn.

Live giant freshwater prawn is a well-established product in the domestic market and retail selling of the species in aerated tanks/aquariums is a traditional and attractive marketing approach. Sales through the catering sector are also an important outlet for giant freshwater prawn. Some of the restaurateurs interviewed indicated strong consumer preference for prawn served grilled/roasted, or fried with vegetables (with curry and/or coconut milk).

Squid and cuttlefish are usually offered in public and street markets as whole and skinless tubes/fillets; some retailers indicated that skinless tubes/fillets have a good demand among working housewives and young couples. In restaurants, squid/cuttlefish dishes are either grilled/roasted, fried with vegetables (with spicy sauces) or served as spicy salad.

Table 38 shows the comparative retail prices for fresh fish at selected street fish markets and public markets in Bangkok. In general, retail prices at street fish markets were slightly lower than public markets with a price difference range of 2.5 to 9.5 percent; however some products like eels, giant freshwater prawn and seabass were at the same price level. Taking into consideration that most supermarkets have similar or slightly higher prices than public markets, we can conclude from this relatively limited data that street seafood markets are currently offering the lowest retail prices for fresh fish in Bangkok.

Table 38: Comparative Retail Prices of Fresh Fish at Selected Street Fish Markets and Public Markets in Bangkok Period: March 2000

Species	Street Seafood Market Price (Baht/kg)	Public Market Price (Baht/kg)
Live Seafood		
Snakehead	75 – 85 Average: 80	80 – 85 Average: 82
Catfish (*Clarias* spp)	38 – 44 Average: 40	38 – 48 Average: 44
Swamp Eel	110 – 120 Average 115	110 – 120 Average: 115
Giant freshwater prawn	n/a	Small: 170 Medium: 250 – 360
Climbing perch	100 – 110 Average: 105	100 – 120 Average: 115
Fresh/chilled Seafood		
Seabass	140 – 145	140 – 145
Black Pomfret	70 – 80	78 – 80
White Pomfret	n/a	295 – 300
Black tiger shrimp	n/a Small: 175 – 200	Large: n/a Medium: 290 – 325
Giant Freshwater Prawn	Small: 110 – 120 Medium: n/a	Small: 110 – 120 Medium: 190 – 260
Squid:		
Whole	95 – 100	100
Skinless	170 – 180	180
Cuttlefish	100	100 – 110
H&G Snakehead	n/a	100
Snakehead (with roe)	n/a	150 – 170

Source: field market surveys carried out by the author and counterparts in March 2000.

Table 39 shows a comparison of average wholesale and retail prices for selected fish species in Bangkok. From the data, the estimated marketing margins for chilled fish ranged from 8.3 to 66.6 percent, with an average margin of 37.9 percent. Although based on the relatively limited data obtained from the field surveys carried out for this study, in general the results obtained were in line with the marketing margins from retailers in public markets.

In most public markets, there are full-service seafood stalls which prepare orders from consumers. This may include weighing a specific quantity of fish or shellfish, gutting, cleaning or cutting a whole fish to the desired size or product form. Orders are then wrapped in plastic bags.

Table 39: Average Gross Marketing Margins for Selected Chilled and Live Fish Species in Bangkok
Period: January – March 2000

Species	Average Wholesale Price (Baht/kg)	Average Retail Price (Baht/kg)	Marketing Margin (%)
Chilled Seafood			
Indian Mackerel (*Rastrelliger kanagurta*)	18	30	66.66
Spanish Mackerel (*Scomberomorus* spp.)	29	50	72.40
Threadfin (*Nemipterus* spp.)	90	130	44.44
Seabass (*Lates calcarifer*)	105	142.5	35.71
Black Pomfret (*Formio niger*)	65	77	18.46
White Pomfret (*Pampus argenteus*)	255	297.5	16.66
Squid (*Loligo* spp.)	65	98.3	51.20
Black Tiger Shrimp (*Penaeus monodon*)	Small: 180	Small: 200	Small: 11.50
	Medium: 300	Medium: 325	Medium: 8.30
	Large: 425	Large: n/a	Large: n/a
Live Seafood			
Giant Freshwater Prawn (*Macrobrachium rosenbergii*)	Small: 110	Small: 170	Small: 63.60
	Medium: 240	Medium: 358	Medium: 49.20
	Large: 520	Large: n/a	Large: n/a
Catfish (*Clarias* spp.)	35	42	20.00
Snakehead (*Ophicephalus striatus*)	60	81	35.00
			Average margin: 37.90%

Source: FMO and market surveys carried out by the author and counterparts

Table 40 shows a comparison between average retail prices of fresh meat, poultry and fish offered in Bangkok's retail food market. When compared with popular small pelagic species, beef was the most expensive animal protein source, with an average retail price of US$ 4.35/kg for beef tender chuck, followed by chicken breast and lean pork with average retail prices of US$ 3 .04 and US$ 3.13/kg respectively. Dressed chicken with an average retail price of US$ 1.76/kg, and small pelagics such as Indian mackerel and hardtail scad, with an average retail price of US$ 0.79/kg and US$ 0.66/kg respectively, were the cheapest protein source. However, when compared with available fresh meat, poultry and seafood in general, the most expensive animal protein sources were black tiger shrimp and white pomfret with average retail prices of US$ 8.31 and US$ 7.28/kg respectively. It is important to note that the popular freshwater fish species such as catfish, snakehead and eel, are direct competitors in price with respect to chicken products (the main substitute for fish in Bangkok market), with average retail prices of US$1.08, US$ 2.13/kg and US$ 3.03 respectively. The highest retail prices for red meats and poultry were seen in supermarkets and the lowest in public/private markets and street vendors.

Table 40: Comparative Average Retail Prices of Meat, Poultry and Fish in Bangkok
Period: March – May 2,000

Product	Average Retail Price (Baht/kg)
Red Meats:	
Lean pork	80 – 138 (118)
Pork loin	79 – 80 (79)
Beef loin	90 – 120 (100)
Beef tender chuck	120 – 190 (165)
Poultry:	
Dressed chicken (chilled)	45 – 79 (67)
Chicken breast /chilled)	68 – 139 (115)
Chicken, drumstick (chilled)	50 – 82 (71)
Small Pelagics (whole)	
Indian mackerel	30
Round scad	25
Other Fish Species (whole)	
Spanish mackerel	70
Catfish (*Clarias* spp) (live)	42
Eel (live)	115
Snakehead (live)	81
White pomfret	276
Black tiger shrimp (medium size)	315

Source: market surveys carried out by the author and counterparts

The retail market for surimi-based products includes fish balls, squid/cuttlefish balls, fish noodles, fish burgers, fish sausages, fish satay and surimi analogues. In addition, minced dried fish/shrimp crackers and seasoned dried fish mince (locally processed) are also offered in the market. Public retail markets and supermarkets currently offer a variety of traditional minced products and surimi-based products. Traditional fish and squid balls, fish cakes, and fish satay are consumed mainly deep fried, grilled/roasted, in soups or sautéed with mixed vegetables. Surimi-based dried snack foods with different seasonings, either shredded or as small portions (rectangular sheets) are increasingly gaining popularity among consumers, competing with roasted dried squid/cuttlefish products.

The shelf space devoted to chilled/frozen surimi products in two medium-sized Bangkok's super-markets was considered adequate in comparison to the main seafood counter at the same supermarkets. The surimi-based product shelves area were located in the same section as fresh and frozen processed seafood items. Surimi-based snacks and traditional roasted dried squid/cuttlefish were located in the food snacks section.

Besides the above-mentioned minced fish products, value-added items such as fish portions, fish fingers, nuggets, tempura fillets, squid rings, cuttlefish/squid/fish/shrimp patties and value-added shrimp products were locally processed and marketed in several supermarket chains.

5.4 Live Fish Marketing and Basic Equipment

It is a well-known fact that live fish and shellfish commands a premium price because of its guaranteed quality, freshness and intrinsic flesh characteristics (better texture and delicate flavour) in comparison with fresh/chilled seafood. The tastes, traditions and cooking styles of the population determine Bangkok's live fish and shellfish market requirements. In general, the live fish sold in Bangkok are mainly freshwater species such as catfish (*Pangasius spp; Clarias spp.*) carp (*Puntius gonionotus; Cyprinus carpio; Probarbus jullieni; Hypophthalmichthys molitrix*), gourami (*Trichogaster pectoralis*), snakehead (*Ophicephalus striatus*), swamp eel (*Fluta alba*) and giant freshwater prawn (*Macrobrachium rosenbergii*). Live high value marine finfish is a niche market for affluent tourists, the upper class population and businessmen. On the other hand, giant freshwater prawn has a wider market than high value finfish and is offered in most public markets. Live low-priced freshwater fish and giant freshwater prawn are well-established products in the catering business.

There is a significant live grouper export trade, with production coming both from capture fisheries and cage culture. About 85 percent of the total production of cage cultured grouper is exported, with the marketing channels involving brokers/collectors and exporters. Live groupers for the domestic and export markets are transported in plastic bags filled with water, ice and oxygen; the bags are packed into polystyrene foam boxes with an average gross weight of about 12 – 15 kg/box. Marketing margins[6] for live grouper represent about 44 – 45 percent of the export price, of which 7.5 percent represents the local wholesaler's/collector's margin and 37 percent the exporter's margin.

Live aquatic food display systems have traditionally been an effective marketing device in public and street food markets and restaurants. Tourist seafood restaurants as well as traditional Thai and Chinese seafood restaurants offer a selection of live aquatic food, such as giant freshwater prawn, oyster, eel, snakehead, catfish, gourami and seabass.

Live seafood is displayed in tanks, plastic containers and aquariums for customers to appreciate the variety of species available and facilitate the selection. There is a premium on size, with larger fish often commanding higher prices than smaller fish; demand is significant for live fish within the range of 1 – 2 kg in the specialised seafood restaurant market sector.

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[6] *Marketing and Exporting of Grouper in Thailand* by A. Lawapong and P. Boonchowong

5.4.1 Vivier Trucks

Currently, vivier trucks transport live freshwater fish from the fishponds. The main features of vivier trucks include portable tanks filled with water, mounted on flatbed trucks; the majority of tanks used in Bangkok are locally made from galvanised iron and externally lined with wooden planks. These portable tanks are of two sizes: the larger ones can hold about 60 kg of live catfish or 40 kg of snakehead; smaller tanks can hold about 40 kg of catfish or 30 kg of snakehead. A typical example of live freshwater transportation system is as follows:

Main equipment:

a) Truck: 2 tonne payload flatbed truck
b) Portable tanks (30 units)
c) Scoop nets (stainless steel frames and nylon netting)
d) Weighing baskets
e) Weighing scales

On arrival at the wholesale market, the live fish is sorted into species and size and distributed to wholesalers, retail markets and restaurants at mutually agreed prices. Fish which are not sold on the day are kept in portable tanks. The fish are normally not fed. During the entire collection, storage and distribution operations, the handling of the live fish is reduced to a minimum to avoid excessive injuries. At the retail or restaurant destination, the fish is transferred to aquariums or portable containers until sold or required for consumption.

Freshwater prawns (*Macrobrachium rosenbergii*) are often held in oxygenated water in portable tanks or in plastic bags and placed within polystyrene boxes. Wholesalers noted that they could obtain increased survival rates when live prawns were packed in oxygenated water, provided that ambient temperatures were not too high during transport. In general, packaging, road transport and distribution operations are relatively short (less than 8 hours) and involve short distances from farms to the market.

5.4.2 Retail Outlets for Live Fish and Shellfish

The main retail outlets for live freshwater fish in Bangkok are public food markets and some street markets. The equipment used for display and retail of these live freshwater fish and shellfish at public and street markets included mainly display tanks/plastic container units. The usual display tank unit (used mainly in public food markets) is equipped as follows:

- Galvanised iron or fibreglass display tanks (rectangular in shape)
- One water pump (for water circulation)
- One mechanical filter

A typical display tank unit had an estimated capacity of about 140 to 160 kg of giant freshwater prawn or 80 – 100 kg of freshwater fish. The display tanks units are an important promotional tool for the fish section and assure consumers of the good quality of live fish being offered. Simple portable tanks/containers filled with water are also used for displaying live catfish, snakehead and gourami in some street food markets.

Most retailers in public markets display portable galvanised iron or FRP tanks equipped with air pumps to maintain adequate oxygen levels. During retail operations, the main quality control measures for live giant freshwater prawns are to keep them below water level, regular addition of small quantities of crushed ice to lower the water temperature and the prevention of injuries caused by rough handling. On arrival at the public markets, freshwater fish and prawn are carefully examined; the weak or dead specimens are removed from the tanks and sold as chilled seafood.

Catfish and snakehead can survive for prolonged periods out of water, provided they are kept moist and relatively cool, as well as handled carefully. Wholesalers and retailers take advantage of the high survival rates of these fish.

Daily supplies of live freshwater fish are delivered to public markets to replenish stocks. On average, each retailer holds stocks of live seafood for at least two working days.

5.5 Street Food Hawkers in Bangkok

Street food hawkers in Bangkok, in particular those selling fresh fish and ready-to-eat seafood, are considered to be catering to the middle and low-income consumers. Current data on the total number of street food hawkers indicates about 26,000 operating in authorised areas. According to Bangkok Metropolitan Administration (BMA) officials, there are three different types of street food vending operations in the 50 Bangkok districts, namely:

a) Those in authorised areas (287 sites of street vending were identified)
b) Those in private areas (21 sites of street vending were identified)
c) Those in non-authorised areas (407 sites of street vending was identified)

The total number of street hawkers includes those vending ready-to-eat foods and beverages, raw food (fruits, vegetables, seafood, poultry), local sweets and delicacies, dry and processed food, manufactured goods (including clothes, toys, footwear, cosmetics) and providing services such as small repairs. Street seafood hawkers currently play a significant role as fresh/chilled seafood suppliers in Bangkok. However, there is no updated detailed data on the number of street fish hawkers operating in the city, besides the 1993[7] figure of 6,040 street hawkers selling raw foodstuff (vegetables, fruits, meat and seafood), which represented about

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[7] FAO. 1994, *Street foods in Bangkok-the nutritional contribution and contaminant content of street foods*, by L.S.R. Hutabarat An Andre Mayer Research Fellowship Study. Rome

30 percent of total street hawkers at that time. The main characteristics of fresh/chilled fish street hawkers include the following:

- Setting up temporary stalls in busy streets around public markets during certain times of the day. These vendors usually operate at fixed and regular locations, mainly using portable equipment, umbrellas and tent-type stalls. It is the simplest type of market available, making use of existing infrastructure and with a low level of investment. In general, facilities/equipment can be relocated easily to another site. When operating in areas surrounding public markets, they compete with the permanent fish retailers

- Carrying fresh fish in HDPE fish boxes, plastic tubs or insulated boxes from the wholesale markets to the street marketing areas using either motorcycles, taxis, public transportation, private cars and vans

- Limited availability of potable water supplies and wastewater disposal systems at the stalls; however, all street fish markets visited had an acceptable common solid waste disposal system and a regular cleaning schedule

- In addition to the regular selling by weight, it was usual to offer a kind of "pantry" service, selling fish and fishery products in extremely small quantities, e.g. sales in small dish lots

- In general, street fish hawkers, when compared with public markets or supermarket chains, offered less variety of fishery products, but with the advantage of being comparatively cheaper. In most street markets visited, besides fish and fishery products, vegetables, fruits and other items such as noodles, rice and fresh chicken were also offered

Retail sales of raw food, in particular fresh fruits, vegetables and fresh fish at busy streets or around public markets by informal vendors in Bangkok are an integral part of the local market place. The "floating market" is a traditional way of street food vending using small boats (blunt-nosed sampans) gathering at various locations along the Chao Phraya River canals (*klongs*). These retailers sell mainly fresh fruits and vegetables.

Currently Bangkok is confronted with the problem of street hawkers and the need to control street litter, effluent disposal, pollution and obstruction of pedestrian traffic. The municipal authorities authorise and regulate street vending through the city police and district Public Health Sections.

Significant improvements in the ready-to-eat food and beverages street vending operations have been achieved through a 1994 FAO-supported pilot project aimed at improving the quality and safety of street vended food in Bangkok. In addition, sanitary requirements for street food stalls were formulated and implemented by local authorities. Another FAO-supported project aimed at improving the quality and safety of street vending in Bangkok was implemented in October 1997.

The Public Health Act (B.E.2535) issued on 5th April 1992 regulates street food vending operations. Chapter 8 (*Marketplace, Place where Meals are Sold and Place where Foodstuff is Stored*) sections 34 to 37, indicated the need for an official license to establish a marketplace and to be subject to supervision by local government authorities. Chapter 8, sections 38 to 40, indicated the need to notify local authorities and obtain a certificate of notification in order to set up a place where meals are sold or where foodstuff is stored, if the said place has an area not exceeding 200 m^2. This Act also describes the powers and duties of local officials and public health officials; the issue of licenses; fees and fines; procedures of appeal and penalties for violations of the Act. In addition, local officials have the authority to establish the basic requirements for street food vending practices, suitable locations of stalls and non-selling zones in the city.

With the implementation of this Act and FAO-assisted pilot projects, the National Department of Health (DOH) and Bangkok Metropolitan Administration (BMA) launched specific activities to provide technical advice on improved street food vending infrastructure and handling practices, and to update general information about street food vendors, in particular socio-economic information and current food handling practices.

The main factors for the growth of street food vending in Bangkok can be explained as follows:

i) Local eating habits, cultural significance of street food hawkers, socio-economic conditions, high unemployment rates, rapid urbanisation and urban population growth

ii) Loyal patronage of a growing clientele; street food vending has emerged in response to a socio-cultural need for inexpensive nutritious foods and the convenience that street ready-to-eat foods offer. In addition, it is recognised that a large number of tourists are also regular consumers of ready-to eat foods offered by street vendors. In the particular case of fresh raw seafood, informal street markets operating in strategic locations (mostly around public food markets) at busy hours of the day serve customers, thereby saving them time and/or money in search of other markets or supermarkets

iii) The effects of the Asian financial crisis, which dragged Thailand's economic growth down, had severely hit the urban poor population. Consequently, street food vending activities flourished

In general, it was observed during field surveys that fish and fishery products offered by street hawkers were of acceptable to good quality. Consumers appreciated the convenience of obtaining readily available seafood at street fish markets, which also provided personalised services with adequate seafood expertise. Some street fish retailers indicated that low-income families purchase their food (including fish) on a daily basis, since they don't have enough money to purchase large amounts of food. Therefore, they usually purchase fish by the small dish in street markets, as it is more convenient for them. Apparently, the sale of fish by the small dish is a traditional service only offered by street seafood vendors. Our limited retailer's survey also indicated that street vended fish is purchased by people from mostly all income levels and not exclusively by low-income families. Based upon a relatively limited knowledge, it cannot be assumed that customer satisfaction is necessary for loyalty and that loyalty is necessary for repeat purchases of street vended fish. This hierarchical assumption can be inaccurate because repeat purchasing is not necessarily contingent upon customer satisfaction and loyalty. Convenience, strategic location and affordable prices can also directly influence repeat purchase of street vended fish.

At most of the informal street seafood markets visited, adequate to fair conditions were observed regarding fish handling practices. Generally, seafood was displayed without ice; however shrimp and squid were usually displayed and kept in plastic tubs or trays in a slush of ice and water. However, most street fish vendors had at least one insulated box to keep chilled fish with crushed ice and one (1) 15 – 20 litres capacity plastic bucket for storage of potable water for fish cleaning. Some large stalls had at least one HDPE- lined insulated container to keep fish with ice. Regarding the variety of fish and fishery products at street markets, most stalls offering fish had less than ten (10) fresh/chilled fish species or 5 to 6 fishery products (mainly minced, cured and fermented) on display. Most fish hawkers indicated that they were handling inventories of fresh fish from one to two working days. All street fish hawkers were somehow specialised, selling either fish/chilled fish, live fish or cured fish; however live fish hawkers were also offering dead specimens in fresh/chilled form. On average, street seafood vendors operate about 6 – 8 hours daily; most indicated that the average number of working days is about 7 days per week. The average daily sales per stall are about 45 – 50 kg of fresh fish and shellfish, 6 – 8 kg of dried/cured fish and 6 – 9 kg of fermented fish/shrimp paste.

The use of simple dial metallic thermometers is suggested to regularly measure temperature of seafood on display at street fish markets. These thermometers can easily be calibrated to a known temperature by adjusting a hex nut located under the dial. They were locally available at some supermarkets and specialised shops. This basic tool could be included as part of the training kit for street fish vendors. In addition, adequate supplies of potable water (tap water), as well as adequate wastewater drainage systems should be made available to each street fish stall. Our limited street seafood/freshwater fish wholesalers and retailers survey indicated that women are actively involved in the operations of street seafood stalls in Bangkok. Their involvement in the street seafood wholesale and retail trade reflects the need of most poor women to balance the earning of income with household responsibilities. A limited gender analysis showed that women and men run street seafood vending as a family business. Few women indicated the difficulty in balancing the demands of business and family. Most said that street fish vending gave them greater time flexibility than other types of jobs/businesses, with the advantage that it does not need as much capital or as many skills.

To be effective, statutory requirements for street food vending (including licensing), should be properly linked to training, monitoring, supervision and equipment/infrastructure development programmes. In particular, street fish vending should have adequate provision of basic facilities for handling, chilled storage, preparation and wastewater disposal, which can be provided by targeting busy street areas where seafood vendors regularly operate.

Regular training courses on fresh/chilled seafood handling and hygiene should be part of any development programme for street seafood vendors organised by the Bangkok Metropolitan Administration (BMA) in co-ordination with the relevant specialised government agencies. This training should be aimed at providing adequate guidance and technical assistance to seafood hawkers on proper seafood handling and personal hygiene practices. All stall holders and their assistants who are involved in the preparation and sale of seafood should be required to attend and pass this training course.

Basic technical fields, which may be relevant for training courses intended for street fresh seafood vendors, are as follows:

i) Introduction to the concepts of freshness, quality, wholesomeness and nutritive value

ii) The care of live and fresh fish, handling methods, use of ice, receiving deliveries, quality inspection, storage of live and chilled fish, hygiene and sanitation for fish retailers, selection and application of detergents and disinfectants

iii) Quality and quality aspects at retail level, display of fish, and promotion of fish sales techniques. Avoiding bad marketing practices

iv) National and municipal regulations and codes of practice for seafood vending

v) Introduction to business planning; simple economics for fish retailing

vi) Equipment and facilities development programmes for street seafood vending

5.5.1 Examples of Street Food Market Outlets in Bangkok

5.5.1.1 Phrannok Street Seafood Market

Phrannok street seafood market operates in one of the streets beside the Phrannok private food market located within the Bangkok Noi district area. The latter sells meat, poultry, seafood, fruits and vegetables, as well as dry groceries and cured and fermented products. During the survey period, a total of 300 fixed stalls were operating inside this retail market, of which about 10 stalls offered live and fresh/chilled seafood. The seafood section consists of typical concrete fish stalls, equipped with washing basins, potable water supplies, concrete display platforms for chilled fish, insulated boxes, concrete cutting area lined with tiles, display lighting adequately mounted on the wall and galvanised iron holding tanks or portable containers for live fish storage.

In this street seafood market outlet the following food items were offered:

i) Fresh seafood
ii) Cured fish (traditional dried fish and smoked fish)
iii) Fermented fish sauce and shrimp paste
iv) Squid/fish balls
v) Fresh fruits and vegetables

Bangkok's typical street seafood outlets are usually located near public and private markets. They operate during the same working hours of the markets, including special days such as religious holidays and other days when the markets are closed. According to vendors interviewed in Phrannok street market, all stall displays are ready in the designated locations between 07:00 hours to 09:00 hours. At the end of the working day (14:00 hours to 15:00 hours) street vendors should remove all their equipment away from the streets. The solid and liquid wastes are collected by the market cleaning staff and placed in offal bins for further disposal. Daily stall rental fees are 16 Baht/day for fixed stalls located inside the covered market and street seafood vendors are charged 10 Baht/day.

The basic equipment of street seafood vendors consisted of folding umbrellas, cutting boards, HDPE round containers, trash bins, water containers for washing fish and maintaining the cleanliness of the stall area, insulated boxes, weighing scales, small stainless steel display dishes and round display trays (made of stainless steel, aluminium or plastic). Some large stalls were equipped with stainless steel slabs for fish display. The typical sales or table area per seafood retailer would be in the range of 1.5 to 3 m^2. In addition, they use up some space to keep some insulated boxes that cannot fit below the round display trays and the chopping board. A typical area for a seafood stall would be in the range of 3 to 6 m^2. The most commonly available live and fresh fish species/presentations were as follows:

- Live fish: catfish, snakehead and eel
- Fresh/chilled whole marine fish: groupers, snappers, mackerels, squids, cuttlefish, banana shrimp, black tiger shrimp and giant freshwater prawn. Molluscs: mussels, arc shell, top shell, clam
- Steaks: tuna and Spanish mackerel
- Fillets: skinless squid and cuttlefish tubes

The most common materials used for manufacturing the round display trays are aluminium and plastic. In most locations visited, retailers displayed their fish in standard aluminium round display trays; in some stalls, whole shrimp was displayed in small stainless steel dishes (on top of a round display tray) and sold by volume. The round display trays were placed on top of a framework made of galvanised steel pipe (threaded) of about 63.5 mm in diameter. After market hours, all equipment was washed with clean water; wastes were collected in plastic bags and placed in offal bins and the stall area was rinsed with clean water. The services of cleaning personnel are included in the daily stall rental fees.

According to the street seafood retailers interviewed, about 90 percent of the freshwater fish in the consignments arriving at the market are still alive and these fetch the highest prices, according to the size and condition upon arrival. The retailers do not usually buy the fish that have died, but often when supplies are limited they are forced to; these fish fetch about 50 – 60 percent of the price of live specimens. Based on their experience, street fish retailers were aware that storage in clean freshwater allows catfish and snakehead to survive from 3 to 4 days and eels from 4 to 5 days. Most street freshwater fish retailers said that the traditional galvanised iron containers (50 – kg capacity of live fish) used for transportation of live freshwater fish is also used for stowage of live fish at the stalls. Survival rates of giant freshwater prawns at retail level vary according to the available facilities. For example, retailers with fixed stalls in public/private covered food markets, equipped with galvanised iron tanks (1 m x 1.2m x 0.5 m) or large size aquariums, air pumps and air distribution piping at the bottom of the tanks, indicated that the average survival rate for healthy specimens of giant freshwater prawns held in tanks was about 7 – 15 days, with regular feeding. Lowering the water temperature in the tanks to about 24 – 28°C with small amounts of crushed ice, is usually practised by these retailers, in order to make handling easier and less stressful for the prawns. However, they know by experience, that if the giant freshwater prawns are chilled too much, they will not survive. Adult freshwater prawns are tolerant to a wide temperature range from 18 to 34°C[8].

Figure 84 illustrates the general layout of a typical street fish retail market located in the Phrannok area, Bangkok. Table 41 shows the details of the estimated investment costs of basic equipment used by a typical street fish retail vendor in Bangkok.

Table 41: Estimated Investment Costs of Basic Equipment used by a Typical Street Fish Retail Vendor in Bangkok

Description of Item	Quantity	Cost per Unit (Baht)
Umbrella	2	1,325
Round display trays (aluminium)	10	100
Small display dishes	15	40
Plastic container (trash bin)	1	60
Plastic containers	10	60
Insulated box	1	2,200
Container for live fish (50 kg capacity of live fish)	1	600
Water bucket	1	50
Plastic bags	100 pieces	0.45
Weighing scale (20 kg capacity)	1	480
Chopping board	2	300
Filleting knives	2	40
Total Cost:		**8,965**

Source: field surveys conducted by the author and counterparts

5.5.1.2 Street Wholesale Market for Live Freshwater Fish

An interesting variant of the street seafood market is the wholesale market for live freshwater fish, located in one of streets behind the wet vegetables and meat, poultry and seafood retail hall within the premises of the Fresh Food Market complex (also known as the "Thai Market"). This privately-owned wholesale outlet is specialised in sales of a variety of foodstuff, including agricultural and fishery produce at reasonable prices.

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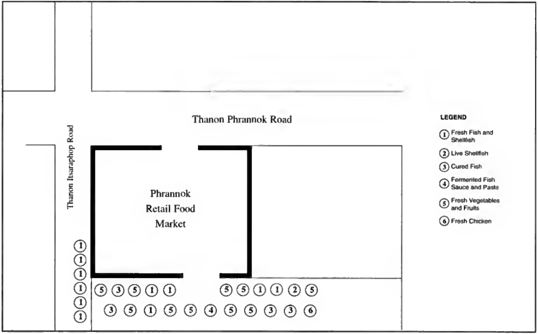
[8] *Freshwater Prawn Culture: a Review*, by Michael B. New, *Aquaculture*, 88 (1990) 99-143

Figure 84: Layout of a Typical Street Food Market in Bangkok (Phrannok Market Area)



The main characteristics of this street wholesale market for live freshwater fish are as follows:

i) This marketing scheme usually operates seven days a week, from 13:00 hours to 22:00 hours. Wholesalers/retailers are charged a daily fee by the Fresh Food Market management for stall space allocation. Most wholesalers are trading live freshwater fish, but there are also some small-scale wholesalers/retailers who sell fresh/chilled whole freshwater fish and minced fish. The wholesalers transport the live freshwater fish from fish farms or rural areas to the market area, using pick-up vans/lorries for temporary live fish storage at the market place

ii) The Fresh Food Market complex provides the following services:

  - Rental of stall space allocation according to the needs of each wholesaler
  - Market price information
  - Adequate security and logistic services to attract institutional buyers, retailers and consumers
  - Supervisory services to manage wholesalers' requirements and ensure adequate levels of cleanliness
  - Parking provision for pick-up vans and lorries carrying live fish

iii) All the live freshwater fish wholesalers operate from vans and small trucks; live fish is displayed in metal tanks with an umbrella to provide protection from the rain and sun. Whole chilled freshwater fish is usually kept with crushed ice in insulated boxes. The typical wholesale street stall for live fish consists of about 3 – 5 galvanised iron display tanks filled with water in which fish is kept, two umbrellas, weighing scales and scoop nets. This type of stall has the advantage that it can be easily assembled at site and after market hours can be loaded on the vans and moved to another market location. The typical sales or tank area per wholesaler would be in the range of 2 to 3.5 m^2

iv) Live freshwater fish supplies were mostly from fish farms while fresh/chilled freshwater fish supplies were collected from small-scale fishermen. Most of the street fish vendors were wholesalers, but who also retailed to consumers. They indicated that the frequency of purchases of fresh seafood was 6 – 7 days/week. Average daily sales were about 400 – 600 kg of live fish. The unit of sales of live and fresh fish at the wholesale level was the plastic bag (±10 kg. net weight); at the retail level, the fish were sold by weight. Some retailers selling live fish at public markets usually purchase their supplies by the container (50 – 60 kg) based on the total weight of the lot

v) The most common live and fresh/chilled freshwater species identified at this street wholesale market were as follows:

  - Catfishes (*Clarias spp. and Pangasius spp.*), snakeheads (*Ophicephalus striatus and Channa spp.*), snakeskin gourami, climbing perch, spotted spiny eel, whisker sheatfish, great white sheatfish, swamp eel, tilapia, grey featherback, Jullien's golden-price carp, silver common carp and common carp

- Pond snail (*Sinotaia ingallsiana*) was offered as whole and shucked meat; frogs (*Rana spp.*) were mostly offered alive. Most giant freshwater prawns were offered alive or in whole fresh/chilled form at fixed stalls inside the fresh food market section

- During the market surveys there were some wholesalers/retailers offering minced fish (made from spotted featherback, Jullien's golden-price carp and catfish), chilled eel steaks, H&G climbing perch and gourami.

Table 42 shows the average wholesale prices of selected freshwater fish traded at the street wholesale market located in the premises of the Fresh Food Market complex in Bangkok.

Table 42: Average Wholesale Prices of Selected Freshwater Fish at the Street Wholesale Market, Fresh Food Market in Bangkok
Period: March 2000

Species/Product Form	Wholesale Price (Baht/kg)
Live	
Catfish (*Clarias* spp.)	28
Swamp eel	60
Climbing perch	50 – 55
Pond snail	10
Snakehead	45
Giant freshwater prawn	
Small size	170
Medium size	250
Fresh/chilled	
Catfish (*Pangasius* spp.)	15 – 23
Spotted featherback	40 – 45
Tilapia	
Small size	12 – 13
Medium size	15 – 20
Large size	30 – 35
Silver common carp	20
Yellow *Mystus*	60
Greet white sheatfish	70
Jullien's golden-price carp	20 – 23
Giant freshweter prawn	
Small size	100 – 110
Medium size	130
Shucked pond snail	30 – 35
Minced Jullien's golden-price carp	35 – 38
Minced spotted featherback	120
H&G gourami	35
H&G climbing perch	35 – 36

Source: field surveys conducted by the author and counterparts

Table 43 shows the estimated costs of basic equipment used by a street wholesaler of freshwater fish (mainly catfish) operating in the "Thai Market". This wholesaler makes daily trips to farms (about 50 km. from Bangkok) collecting about 600 kg of live catfish. The catfish are graded according to sizes, placed in galvanised iron containers filled with fresh water and transported. At the street wholesale fish market, the wholesaler parks his pick-up van parallel to the sidewalk of the main street and assembles the display facilities on the street. Average daily sales are about 500 to 600 kg of catfish.

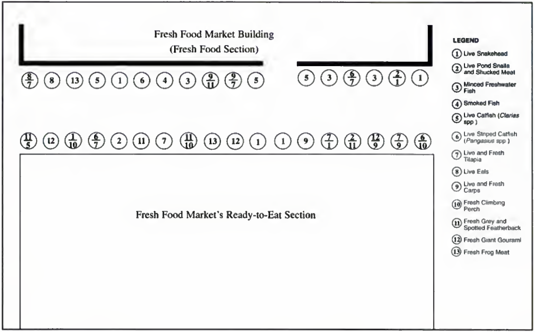
Some large wholesalers are equipped with one lorry and two pick-up vans and reported daily sales of five tonnes of live fish. Some of the large wholesalers run their operations as a family business, with the father and elder sons working as drivers and the mother and daughters conducting the daily sales at the street market. One large wholesaler indicated that he paid daily rental fees for five stall space allocations (each stall space allocation is about 2m^2). Figure 85 illustrates the general layout of the street wholesale market for live freshwater fish located in the "Thai Market".

Table 43: Estimated Costs of Basic Equipment used by a Street Wholesale Vendor of Freshwater Fish in Bangkok

Description of Item	Quantity	Unit Cost (Baht)
Pick-up van (1 tonne) with wooden body (second-hand)	1	300,000
Galvanised iron container for live fish transport (galvanised iron inner walls and external wooden planks frame; 50 – 60 kg capacity)	10	600
Stainless steel live fish display tanks (0 .9m x 0.57m x 0.2 m)	2	2,500
Weighing basket (iron frame with nylon netting)	2	500
Scoop net (steel frame and wooden handle)	1	250
Umbrella	1	1,300
Plastic bucket	1	60
Plastic tray (for removal of live fish from the display tanks)	1	90
Price board	1	300
Plastic bin (offal collection)	1	90
Weighing scale (20 kg capacity); platform type	1	500
Portable calculator	1	200
Total Cost of Basic Equipment		**314,790**

Source: field surveys conducted by the author and counterparts

Figure 85. Layout of a Street Wholesale Market for Live Freshwater Fish (Fresh Food Market, Bangkok)



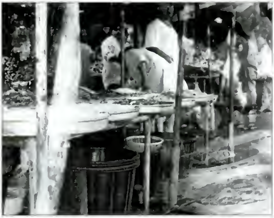


Figure 86. Overall view of a street fish retail stall located outside a private food market, Bangkok.

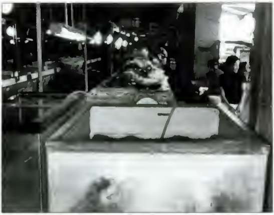


Figure 87. Side view of a live prawn retail stall, at the private food market, Bangkok.

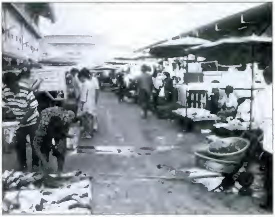


Figure 88. Overall view of a street wholesale market for live freshwater fish. Fresh Food Market, Bangkok.

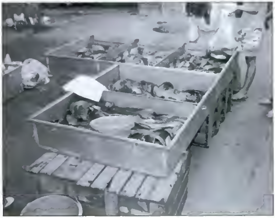


Figure 89. Side view of a street live catfish wholesale stall. Fresh Food Market, Bangkok.

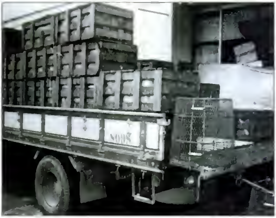


Figure 90. Side view of a typical live fish transport truck. Street wholesale market for live freshwater fish, Bangkok.

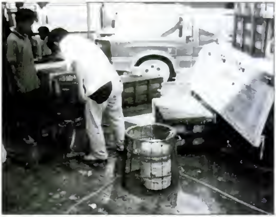


Figure 91. Unloading and weighing operations for live freshwater fish. Street wholesale market for live fish, Bangkok.

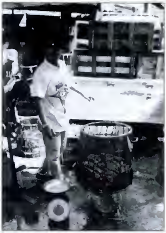


Figure 92. Low-cost live fish handling basket, made of iron bars and nylon mesh. Street wholesale market for live freshwater fish, Bangkok.

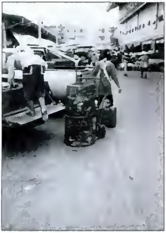


Figure 93. Typical handling and loading of live fish onto a client's van, using low-cost handling baskets and a pushcart. Street wholesale market for live freshwater fish, Bangkok.

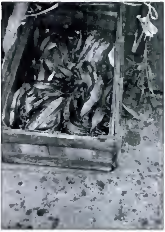


Figure 94. Typical low-cost live fish transport box, locally made using galvanised iron sheet and wooden planks.

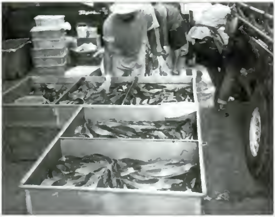


Figure 95. Sorting and displaying operations for live fish using portable stainless steel display tanks. Street wholesale market for live freshwater fish, Bangkok.

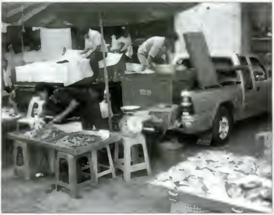


Figure 96. Overall view of a typical motorised street chilled fish wholesale stall. Fresh Food Market, Bangkok.

6. CONCLUSIONS AND RECOMMENDATIONS

This study aims to draw a profile of low-cost retailing equipment and facilities for fish marketing in the large urban areas of Southeast Asia, as it examines the status, problems and needs of those in the fish retail trade, in particular the street fish vending sector.

The study made use of secondary data from four major sources, the national agencies in charge of fisheries affairs, national fish marketing agencies, local governments and the FAO statistics database. For the study to accurately reflect low-cost fish retailing equipment and facilities in large urban areas of Southeast Asia, surveys were conducted as a source of primary data. The data was related to the available equipment/facilities being used, technical characteristics, investment and operational costs, as well as street fish vending operations and critical issues; improved technologies for urban street fish retailing; training programmes for street fish vendors; national legislation; and improvement programmes related to urban street fish vending. Direct observation during field visits provided qualitative and quantitative data on matters such as: current situation of street fish vendors; the selling prices of fish at both wholesale and retail levels; physical and operational conditions prevailing in street fish markets; local costs of equipment; live and chilled fish handling and display practices, as well as sanitary conditions and design deficiencies at marketplaces.

Currently, some of the street fish vending operations in Manila, Bangkok and Kuala Lumpur exhibit specific characteristics according to the pattern of operation, the location of the stalls, the type of fish and fishery products offered, the equipment used and the working hours. In Singapore, all street fish vendors have been resettled into public markets and food centres since 1986. In general, two main patterns of operation were identified:

- Street seafood/freshwater fish vendors selling from mobile facilities. These are typical motorised retail outlets specialised in the trade of fish and fishery products. In this category we can include marketing schemes such as "Fish on Wheels" and *Pasar Tani* as well as the street wholesale and retail live freshwater fish outlets. There were also ready-to-eat fish/squid balls and traditional sausage vendors peddling from place to place using wheeled pushcarts

- Street fish vendors with equipment that enables them to operate a temporary street retail outlet (unmotorised facility). In this category we can include the typical informal street seafood markets. However, traditional itinerant street seafood vendors peddling from place to place and carrying two baskets on shoulder poles were not very common in urban areas

Most street seafood/freshwater fish vending operations were characterised by the use of low-cost equipment and facilities. In some large urban areas, the available low-cost fish retailing equipment and facilities showed some deficiencies, particularly regarding design, limited potable water supplies and wastewater disposal systems. Water is used extensively in fish markets, not only for fish cleaning, but also to flush offal and blood from equipment and floors, and to flume wastewater to floor drains and collection sumps. The first step for the implementation of adequate potable water supplies to individual stalls at street fish markets should be to analyse water use patterns, install water meters and regularly record water consumption. The next step should be to undertake a survey of all market area and ancillary operations to identify wasteful practices and undertake corrective actions. Street fish vendors should pay according to their water consumption and proportionally for the provision of wastewater drainage systems. In two of the three large urban areas where street fish vendors operated regularly, solid wastes collection and disposal, as well as daily cleaning schedules were provided by the municipal authorities or private management and service charges were paid by the street fish vendors on an individual basis.

Live fish trade was the usual practice in all the large urban centres investigated. Most street live fish retail vending operations can be characterised by the use of low-cost equipment, with the exception of Singapore. Live fish was usually sold at higher prices than dead fish; most consumers were prepared to pay premium prices for live fish, which is considered the best guarantee of freshness, quality, and intrinsic characteristics of its flesh (better texture and delicate flavour) in comparison with fresh/chilled seafood. Primarily, the tastes, traditions and cooking styles of the local population determine the live seafood market requirements.

The consumption of high-value live seafood is a niche market for affluent tourists, the higher income group, and businessmen, and for special celebrations/ festivities and wedding parties. Gradual economic recovery in most of the large urban areas investigated is slowly bringing consumers back, which is helping the markets for high-priced produce like shrimp, prawn and crab. Shrimp and crab are well-established products in the catering business and regulars in supermarkets, either live or chilled. On the other hand, the consumption of low-priced live fish is a well-developed market for consumers from all socio-economic levels as well as through the catering sector. Domestic markets absorb most of the low-priced aquaculture products like milkfish, tilapia, carp, catfish, eel, snakeheads, oysters, mussels and edible seaweeds.

In some cases, street markets, despite their limitations, are among the most dynamic channels for seafood/freshwater fish marketing. The need for street fish market outlets has arisen as a result of the inability of the existing market infrastructure to keep pace with the rapid population growth, relatively high urban unemployment rates and the negative impacts of the economic crisis on real incomes. Based on limited data and direct observation, we recognise that convenience, strategic location and affordable prices directly influence repeat purchase of street vended fish, rather than customer satisfaction and loyalty.

The study identified some of the problems faced by street fish vendors. These were as follows: the effect of the financial crisis on business and the ability to survive, the lack of access to specialised training on fish retailing, credit, and improved infrastructure and technologies. Hoewer, most street vendors interviewed indicated that street fish vending, in comparison with other types of jobs/businesses, had several advantages, such as that it does not need as much capital or as high a skills requirement. Generally, street vendors used ice to transport and keep fish either in fish boxes, metal tubs or insulated containers. However, in most cases, only high-value fish and shrimp were displayed, well- iced to maintain adequate quality levels. It was noticed that in most street fish markets, there was a lack of adequate chilled storage facilities for common usage by vendors.

The other fish retailing system, which is identified as the modern marketing sector, comprises self-service stores and large supermarket chains. In most cases, these shops cater to the middle and higher-income population groups, which generally have a family car and the capacity to purchase and store relatively large quantities of food. This high volume of sales allows these large market outlets to compete with regard to prices and terms of sale. However, with the exception of Singapore, where there was no street fish vending in all other large urban centres investigated, street fish vending was competing well with the modern marketing sector.

In all large urban centres investigated, there was available legislation regulating the operation of street food vending in general, including fish and fishery products. In most cases, the regulatory framework included the compulsory registration and licensing of street vendors. In the case of Singapore, the main legislation dealing with hawkers was the Environmental Public Health Act, No.32. This was also the case in Bangkok, where the regulations dealing with street food vendors were under the Public Health Act, BE 2535. In Manila and Kuala Lumpur, regulations related to street food vending have been enacted in terms of a law established by a local government authority. Regulations through codes of practice are used in most cities for street ready-to-eat food vending operations. Specific codes of practice for street vending of raw fish and fishery products are still lacking.

Although the role of the informal sector, in particular street fish vending, in providing employment opportunities is recognised, in some cases, its importance in terms of supplying essential services to urban dwellers as well as generating income to the urban poor, is overlooked. Challenging much conventional wisdom about the informal sector, this study documents street fish and fishery products vending as an economic activity that produces an income ranging from minimum wage to higher than average income as compared to public or private clerks. Most successful street fish vendors work in the trade for a lifetime, but there are also a few casual street vendors selling as a supplement to other activities.

The findings support the efficacy of local governments in assisting informal micro-entrepreneurs improve their facilities, food handling practices and sanitation. In addition, adequate official attitudes and policies toward the street ready-to-eat food trade, and efforts within and outside the government to train street ready-to-eat food vendors in food handling and sanitation are positive steps in the right direction. However, similar efforts are needed in relation to street fish vendors, particularly regarding assistance to improve their facilities, fish handling practices and provision of credit.

Based on the findings of the study, recommendations and suggestions to promote the activities of street fish vending and improve fish retail marketing include the following strategies aimed at improving the technology and infrastructure:

- Provide more focused research on the design of improved low-cost fish retailing equipment and facilities aimed at obtaining the most profitable output, through a better selection of alternative materials suitable for fish vending operations. Therefore, it is important to develop adequate low-cost designs, which should include improved technological features in relation to clean water supply, and collection and disposal of solid and liquid wastes

- Formulate and implement adequate training programmes for street fish and fishery product vendors regarding improved facilities and equipment as well as fish handling practices. It is of utmost importance that local governments organise suitable information campaigns concerning the improved facilities and equipment and stimulate the effective participation of the private sector in the provision of low-cost prototypes to the street fish vendors

- Promote agreements between street fish vendors' organisations, local governments, fisheries and health government agencies, NGOs and international technical co-operation organisations for the technical evaluation and dissemination of information regarding improved low-cost prototypes. The main objectives should be focused on the demonstration of the technological advantages as well as the improved sanitary operations of the low-cost prototypes both for the vendor and the consumer

- As the legal status of some street fish vendors remains informal, registration and licensing procedures should be simple and straightforward. In return for the license and fees paid, each street fish vendor should be entitled to access to water taps, regular wastes collection and disposal as well as cleaning services. Stall space should be allocated based on agreements with street vendors' organisations, which should be responsible for the equal distribution of stall space among associates and for monitoring the vending operations

- Formulate adequate small-scale credit programmes for street fish vendors aimed at the introduction of improved low-cost facilities and equipment. These programmes should be designed with the necessary promotion, evaluation, follow up and credit recovery components. In addition, suitable training programmes for personnel from lending institutions should be implemented in order to ensure an adequate administrative and operational framework to carry out credit operations for street fish vendors

- Organising street fish vendors will strengthen their group activities, allow better communication and strengthen their bargaining position with the government. Groups of street fish vendors could facilitate the provision of small-scale credit through lending institutions for improved facilities and equipment. The cost of purchasing fish supplies and ice could also be reduced through group activities

- Encourage national fisheries agencies to develop profiles of successful street fish vendors, including reference to low-cost fish retailing equipment and facilities, to serve as role models

- Strengthen street fish vendors' organisations/groups to help catalyse the dissemination of information on a regular basis in the following areas:
  - Government rules, regulations, taxation
  - Models of improved low-cost fish retailing equipment and facilities, including results of demonstrations, cost estimates and sources of financing
  - Specialised fisheries/fish marketing training programmes offered in the city
  - Updates of fisheries business trends including fish market information services
  - Specialised fisheries/fish marketing fairs, exhibits and others
- Taking into consideration women's active role in street fish marketing, particularly in Metro Manila and Bangkok, it will be desirable to promote women's participation in training activities in the fields of small business management, fish handling and marketing
- It is evident from this study that the amount of research information about low-cost fish retailing equipment and facilities in large urban areas of Southeast Asia, does not yet match the level of interest and need. Therefore, more information is needed about street fish vending operations and their businesses, their number and level of economic contribution, growth trends, the issues and challenges they are facing, and access to improved infrastructure and technologies. Deficiencies in information constitute a major impediment in the planning of improvement programmes for street fish vending. Efforts to reduce these information gaps will be useful in stimulating governments to move toward more effective management of street fish vending, both by indicating the significance of the benefits and the ways in which the benefits can be achieved. Such data should come both from official government surveys, and from non-governmental organisations such as associations and universities. International agencies could remedy these deficiencies by supporting and possibly conducting research, provide expertise for the design and implementation of training programmes, as well as asist in specific technical areas.

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This paper describes the marketing of fresh and live fish and provides examples of low-cost retailing equipment and facilities used in four large urban centres of Southeast Asia (Bangkok, Kuala Lumpur, Manila and Singapore). It also examines the status, problems and needs of those in the fish retail trade, in particular in the street fish-vending sector. The primary data, collected through surveys and interviews, were related to the available equipment/facilities being used; technical characteristics; investment and operational costs; improved technologies; training programmes; national legislation; and investment programmes related to urban street fish vending. Secondary data comprised information compiled by national agencies and FAO. Based on the findings of the study, recommendations are put forward to promote the street fish-vending sector and improve fish retail marketing, while acknowledging the need for more research to be done in the field.

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